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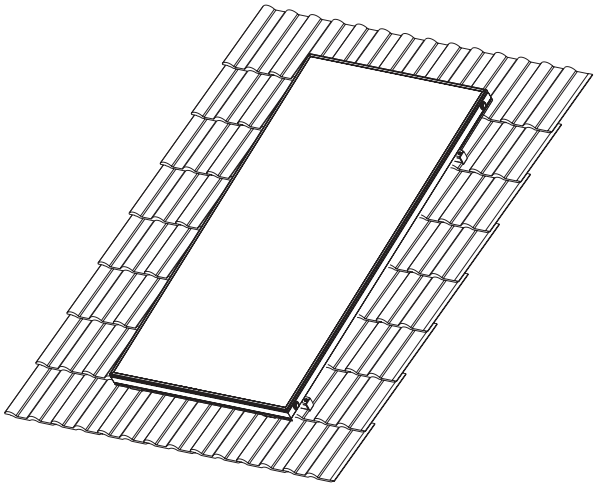
Solar Manual



Please read these instructions before installing or commissioning.
This Solar Thermal Domestic Hot Water System should only be installed by a competent person.

PLEASE LEAVE THESE INSTRUCTIONS WITH THE USER FOR SAFE KEEPING.

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1.0 Introduction to Solar

1.1 Description

1. Thank you for purchasing a high quality Solar Thermal Domestic Hot Water System.

2. The sun is the ultimate source of most of our renewable energy supplies. Energy from the sun is clean and abundant.

3. There is a widely held opinion that the UK does not have enough sun to make solar systems worthwhile. In fact parts of the UK have annual solar radiation levels equal to 60% of those experienced at the equator.

4. However, this energy is not received uniformly throughout the year. Some 70% of UK annual radiation is received over the period April to September and 25% is received in the months of June and July.

5. Solar water heating technology captures energy from the sun and transfers this to a water heater to raise the water temperature therefore reducing the reliance on fossil fuel energies such as gas, oil and electricity. Up to 60% of a dwelling's annual hot water requirement can be provided by a solar water heating system. The balance is provided by traditional means via a second heat exchanger connected to a fossil fuel boiler or electrical heating by electric boiler or immersion heater.

6. The water heating system provides all the principal components required for an efficient solar water heating system. The sun's energy is captured by a series of solar collector panels through which a special heat transfer fluid is pumped. As the fluid passes through the collector panels its temperature is raised. The heated fluid is circulated through a heat exchanger coil in the base of the solar storage cylinder transferring the heat gained to the stored water, gradually raising its temperature. The cooled fluid then returns to the collector panel to be heated again. Heating by the solar coil is controlled by a solar differential temperature controller that ensures the system will only operate when there is useful solar heating gain at the collector panel. As the sun's energy input to the collector panels is variable supplementary heating by a conventional boiler or electric immersion heater should be provided. The optional cylinders that can be supplied with the package provide a supplementary heat exchanger coil and immersion heater as standard.

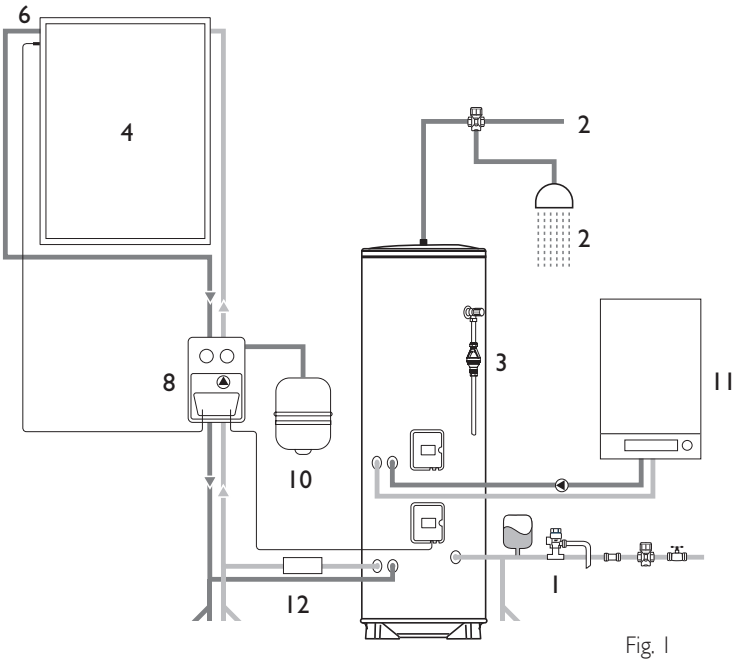

Fig. 1

1	Cold Supply for Domestic Hot Water
2	Domestic Hot Water Outlet
3	Auxiliary Discharge Arrangement
4	Solar Collector 1 (West facing)
5	Solar Collector 2 (East facing)
6	Collector Sensor 1 (PT 1000)
7	Collector Sensor 2 (PT 1000)
8	Solar Pumping Station with Controller
9	Solar Pumping Station Cascade Module
10	Solar Expansion Vessel
11	Auxiliary Heat Source (Central Heating Boiler)
12	Flow Gauge on a 'COMMON' Return *

* Accessory code 84515064

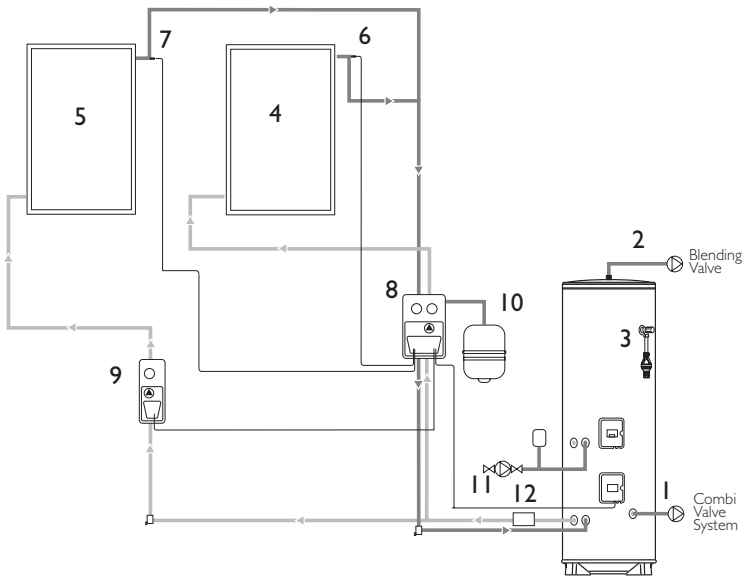

Fig. 2

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2.0 Hydraulic station specifications

2.1 Technical data

Dimensions	(Height/Width/Depth)
System Module	
Pump Station	375/250/190mm
Cascade Module	
Pump Station	375/190/190mm

Flow and return connections
(compression fittings) 22mm

Maximum working temperature:	160°C
Maximum working pressure:	6 bar
Pressure Relief Valve setting:	6 bar
Circulating Pump:	BDR Thermea
Circulating Pump voltage:	230/240 V ~
Power consumption Setting 1:	45W / 45W
Setting 2:	68W / 65W
Setting 3:	90W / 85W
Maximum Pump Head:	6 metres
Maximum Pump Capacity:	4.5 m3/h / 3.5 m3/h
Flow meter scale:	2 to 15 l/min

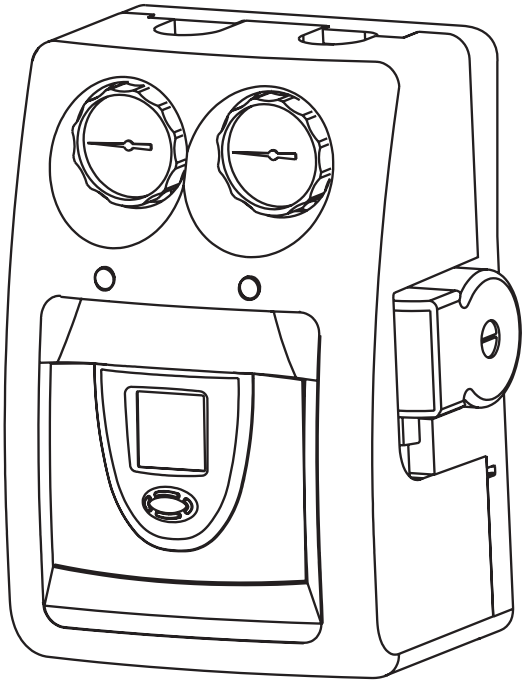

Fig. 3 System Module

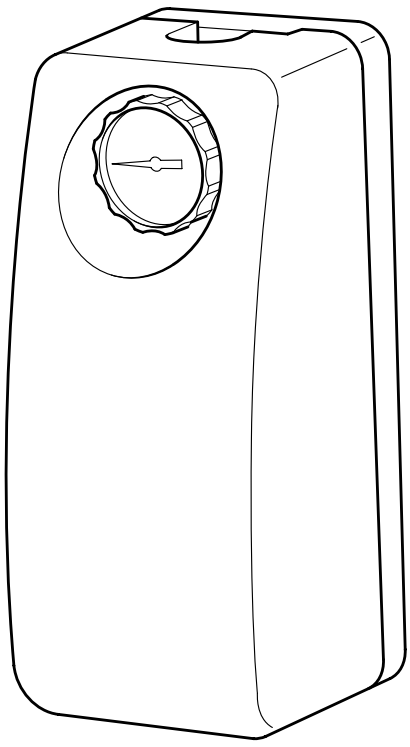

Fig. 4 Cascade Module

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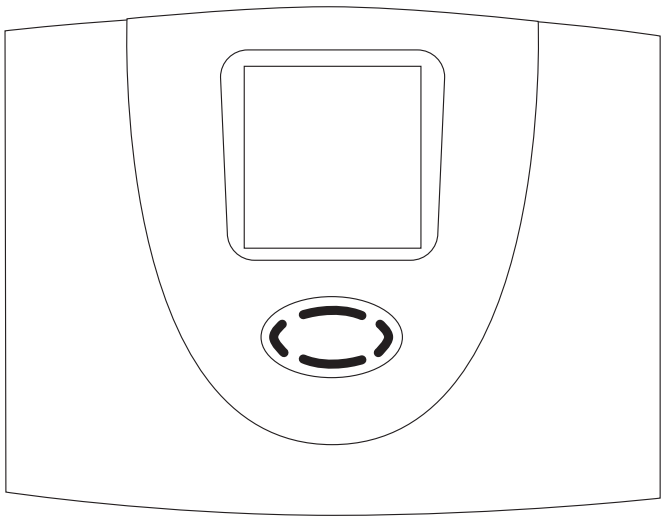

Fig. 5

3.0 Differential temperature controller

3.1 Technical data

Housing

Material	100% recyclable ABS
Dimensions L x W x D in mm	175 x 134 x 56
weight	ca. 360 g
Ingress protection	IP40 according to VDE 0470

Electrical values

Operating voltage	230/240V ~ 50 Hz
Interference grade	N according to VDE 0875
Max. conductor cross-section 240V-connections	2.5 mm2 fine-strand/single-wire
Temperature sensor / temperature range	PTF6 - 25°C to 200°C PT1000, 1,000 kΩ at 0°C
Test voltage	4 kV 1 min according to VDE 0631
Switching voltage	230V / 240V
Capability per one switch output	1A / ca. 230VA for cos j = 0,7-1,0
Total capability of all outputs	2A / ca. 460VA maximum
Fuse protection	fine-wire fuse 5 x 20mm, 2A/T (2 amperes, slow)

Features

Self explanatory, menu driven operation

Adjustable control values

System monitoring

Energy yield, (solar gain) measurement (Accessories required)

Suitable for flat plate and evacuated tube type collectors

Reheat thermostat function (Accessory Sensor required)

Can be used in a number of system configurations

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Expansion vessel

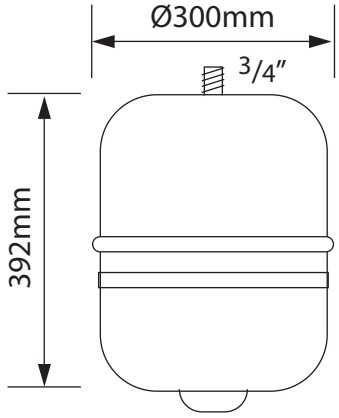

Fig. 6

4.0 Ancillary components

4.1 Expansion vessel

1. Membrane expansion tanks for solar primary heating circuit. Manufactured according to the Directive PED 97/23/CE (approved noZ-DDK-MUC-02-396876-04).

2. Butyl membrane suitable for solar primary heating fluid, DIN 4807-3 approval.

Maximum working temperature +110°C.
Maximum percentage of glycol 50%.
Connection: 3/4" BSP male parallel

3. Expansion vessel supplied with wall mounting bracket and self sealing vessel connection that will allow removal of the vessel for maintenance without losing solar heat transfer fluid.

4.2 Solar heat transfer fluid

1. The system uses a sealed system indirect solar primary circuit which must be filled with the solar heat transfer fluid provided. This is a Pre-mixed (40% glycol / 60% water) Solar thermal transfer fluid, based on1,2 - propylene glycol with corrosion inhibitors. It is Non-toxic, odourless, bio-degradable.

2. **DO NOT** mix the fluid with other types.

3. The use of chemical resistant gloves and suitable eye protection is required when handling.

4. A full safety data sheet is available on request.

5. The system should be filled when there is no direct radiation from the sun. If direct radiation occurs the collector panels should be shaded by covering them during filling and flushing.

6. Although the solar heat transfer fluid is non corrosive and bio-degradable appropriate precautions should be taken when handling.

7. Wash with soap and water if the fluid comes into contact with skin.

8. If fluid gets into eyes, immediately rinse with large quantities of clear running water.

9. The solar heat transfer fluid must be pumped into the system. The pump can be electric or manual but must be capable of producing a pressure of at least 2 bar. The system should be thoroughly flushed to remove any contaminants in the solar primary circuit prior to filling with the heat transfer fluid

10. The fluid is supplied in 20litre container.
Weight of container full - 21kg.

11. Systems found to have low glycol concentrations will not be covered by the warranty.

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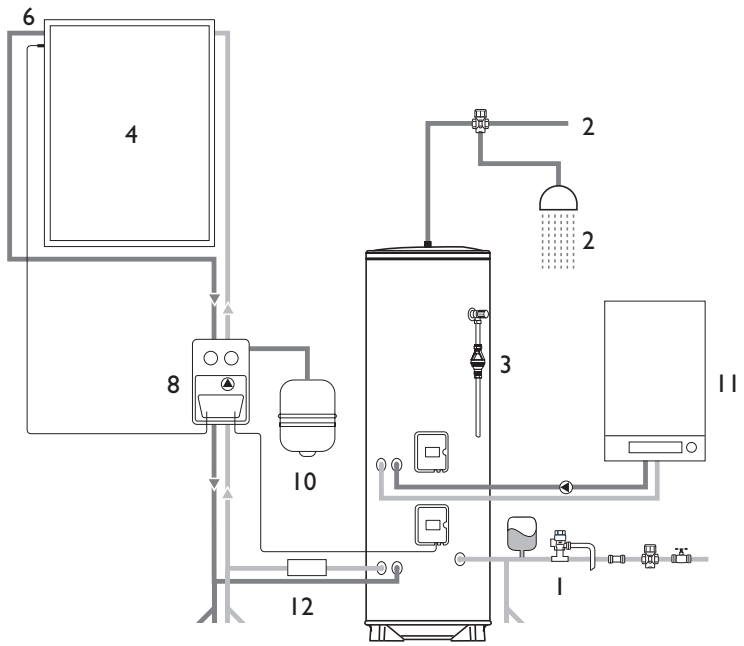
Unvented system - schematic diagram



Note: Indirect twin coil unit shown.

Fig. 7

5.0 Cylinder specifications

5.1 Unvented

Main recommend the use of the Main Solar unvented cylinders.

Nominal capacities 210, 250 and 300 litre.
Rating Immersion heater(s) 1 x 3 kW (indirect models), 2 x 3kW (direct models) @ 240V~.
Outer casing White plastic coated corrosion proofed steel.
Thermal insulation CFC/HCFC-free (ODP zero) flame-retardant expanded polyurethane (60mm thick). GWP 3.1 (Global Warming Potential).
Cylinder Duplex stainless steel.
Pressure testing To 15 bar.
Heat unit Titanium element/s, incorporated into an easily removable heater plate, should replacement be necessary. Rated 3.0kW @ 240V~.
Primary coil (for Auxiliary boiler heating) 22mm diameter stainless steel. Coil in coil design for improved performance
Solar coil 25mm diameter stainless steel. Coil in coil design and large surface area for improved performance.

Thermostat
Direct models: Element thermostat adjustable from 10°C to 70°C.
Indirect models: Factory-fitted cylinder thermostat adjustable to 70°C.
Solar: Factory fitted control pocket suitable for insertion of solar controller temperature probe.

Factory fitted safety features:
Direct models: Manually re-settable cut-out on heating element operates at 85°C.
Indirect models: High limit thermal cut-out operates at 85°C. Wired in series with two-port motorised valve (supplied) to provide primary over temperature protection when using auxiliary (boiler) coil.
All models: Temperature and Pressure Relief Valve, factory set to operate at 10 bar and 90°C.
High limit thermal cut-out operating at 85°C at solar coil position. Wired in series with the solar differential temperature controller to provide over temperature protection if overheating occurs from solar collector panels.
N.B. This must be used in an unvented installation to comply with the requirements of Building Regulation G3.
Anode Not required.

For full technical and performance specification see cylinder installation instructions.
The cylinders are unvented so installation must comply with Building Regulation G3 and / or other local regulatory requirements.

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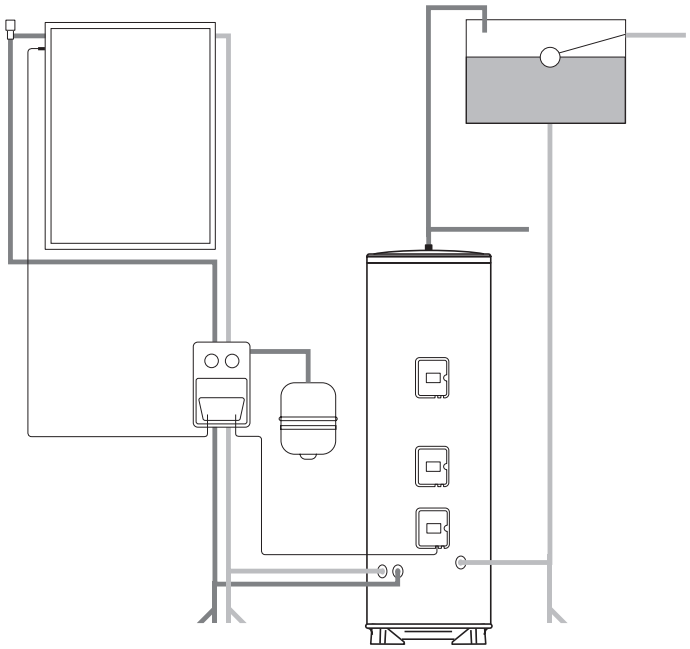
Vented system - schematic diagram



Note: Direct unit shown. Auxiliary heating by immersion heater.

Fig. 8

5.0 Cylinder specifications

5.2

For full technical and performance specification see cylinder installation instructions.

Detailed installation and commissioning instructions are supplied with the cylinders.

Note: The system is also compatible with cylinders configured for solar DHW systems. For installation and specification details refer to the manufacturers instructions supplied with the solar cylinder.

Any system installed using an unvented cylinder must comply with Building Regulations G3 and/or other Local Regulations.

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6.0 Safety Information

6.1 Safety

1. In order to reduce the number of deaths and major accidents attributable to work at height, the Health and Safety Executive has introduced comprehensive regulations and guidance that should be followed by all businesses working at height.

2. We consider in the following paragraphs some of the main features of the regulations and guidance. This is, however, only a limited summary and it is recommended that all businesses planning on undertaking solar water heating installations obtain a copy of the regulations and guidance issued by the Health and Safety Executive and carefully consider the contents.

3. The regulations and guidance state that you are required to carry out a risk assessment for all work conducted at height and to put in place arrangements for:

- Eliminating or minimising risks from work at height.
- Safe systems of work for organising and performing work at height.
- Safe systems for selecting suitable work equipment.
- Safe systems for protecting people from the consequences of work at height.

4. **The regulations and guidance highlight a hierarchy for safe work at height:**

- **Avoid** the risk by not working at height if practicable.
- **Prevent** falls, where it is not reasonably practicable to avoid work at height; you are required to take suitable and sufficient steps to prevent the risk of a fall including selecting the most suitable work equipment (in accordance with the regulations).
- **Mitigate** the consequences of a fall; where the risk of a person or object falling still remains, take suitable and sufficient measures to minimise the distance and consequences of any fall.

5. Collective protection measures, such as guard rails on scaffold, should be given priority over personal protection measures, such as safety harnesses.

6. Within the regulations' framework, you are required to:
a) Assess the risk to help you decide how to work safely.
b) Follow the hierarchy for safe work at height (i.e. avoid, prevent and mitigate).
c) Plan and organise your work properly, taking account of weather conditions and the possibility of emergencies.
d) Make sure those working at height are competent.
e) Make use of appropriate work equipment.
f) Manage the risks from working on or around fragile surfaces and from falling objects.
g) Inspect and maintain the work equipment to be used and inspect the place where the work will be carried out (including access and egress).

7. When preparing to install a solar water heating system, it is required that you perform a risk assessment in relation to work at height and plan how you will organise your work, taking into account the site, the weather conditionsand the experience and competence of colleagues or contractors who may be working at height with you.

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6.1 Safety (cont)

Risk Assessments

8. The HSE has published a number of very useful free publications that advise how to undertake risk assessments.

9. Two of these that you should obtain are:
Five Steps to Risk Assessment.
A Guide to Risk Assessment Requirements.

10. **The five steps outlined in the HSE leaflet are:**

Step 1: Look for the hazards, this will mean looking at the site and identifying significant hazards. These could be features such as a steep roof, a fragile surface where the collectors may be mounted, uneven ground or obstructions where access to the roof might be required.

Step 2: Decide who may be harmed and how, this might mean considering the particular risks that young workers or trainees might face and thinking about the residents of the household or visitors who could be hurt by your activities.

Step 3: Evaluate the risks and decide which precautions should be made, you should consider how likely it is that each hazard will cause harm, decide which precautions you might take and then assess, after you have taken those precautions, whether the remaining risk will be high, medium or low. Where you identify remaining risks, you should consider which further action you could take to control the risks so that harm is unlikely.

Step 4: Record your findings, if you have fewer than five employees you do not need to write anything down, though it is useful to keep a written record of what you have done. If you employ five or more people you must record the significant findings of your assessment. You must also tell your employees about your findings. You need to be able to show that a proper check was made, that you considered who might be affected, that you dealt with all the obvious significant hazards, that the precautions you propose are reasonable and that the remaining risk is low.

Step 5: Review your assessment if necessary, each solar water heating installation may bring its own challenges and present its own particular hazards. You should therefore be careful not to rely on a "standard" risk assessment for installing a solar water heating system in a house, but review the particular hazards for each new situation. The issue of work equipment must be considered, but at the preparation stage you should consider where scaffold or other access equipment might be positioned and look out for any obvious obstacles to this, such as a conservatory or porch. In addition to the risks associated with work at height, you should also consider the risks associated with lifting and carrying solar collectors, using electric drills and using blow lamps or blow torches for soldering. This is not an exclusive list and so you should consider all aspects of the proposed installation to assess whether there are additional risks that need to be taken into account.

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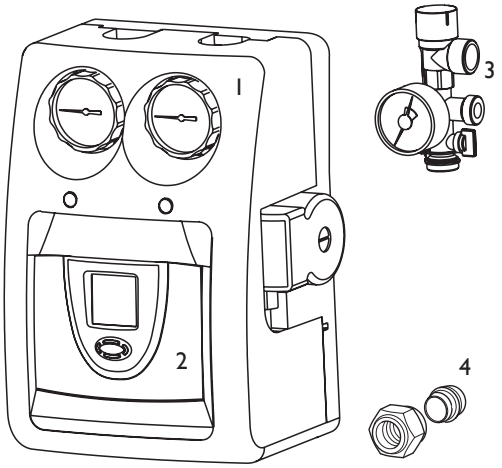
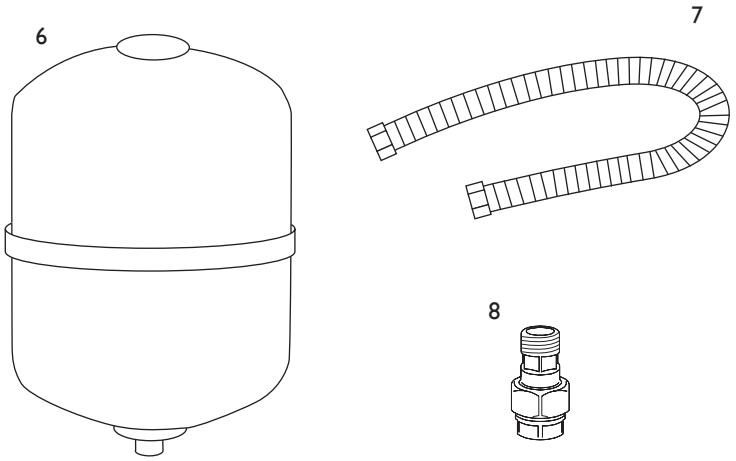
7.0 Installation of hydraulic station

Fig. 9 (Diagrams not to scale)





7.1 Parts list

Before commencing the installation check all listed components are contained in the following cartons.

Hydraulic Station carton:

1. Hydraulic pump station with insulation incorporating wall mounting bracket.
2. Solar differential temperature controller.
3. Safety group, comprising-
   Pressure relief valve, pressure gauge and fill & drain valve.
4. 22mm compression fitting nut and olive(4 off).
5. Sensor extension cable (13m) (not shown).

Ancillary component carton:

6. Solar expansion vessel complete with mounting bracket and strap assembly.
7. Expansion vessel connecting hose.
8. Expansion vessel self sealing connection.

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7.0 Installation of hydraulic station

7.2 Identification of components

1. The main components of the hydraulic station are:

– Two isolating valves (Fig. 10, Item 1 & 2) with integral thermometers which display the solar primary flow and return temperatures.

– A safety group (Fig. 10, Item 3, supplied unconnected), which protects the solar primary circuit. The pressure relief valve and pressure gauge are integrated in the safety group.

– A non-return valve in both feed and return prevents the possibility of gravity circulation in the solar primary circuit.

– A solar circulation pump (Fig. 10, Item 4).

– A flow meter with fill & drain valve and shut-off valve (Fig. 10, Item 5).

– An air separator.

2. The heat transfer fluid is circulated by the solar circulation pump integrated in the hydraulic pump station (Fig. 10).

3. The hydraulic station has a solar differential temperature controller (Fig. 10 Item 6) integrated into the front insulation moulding. This is pre-wired to the solar pump.

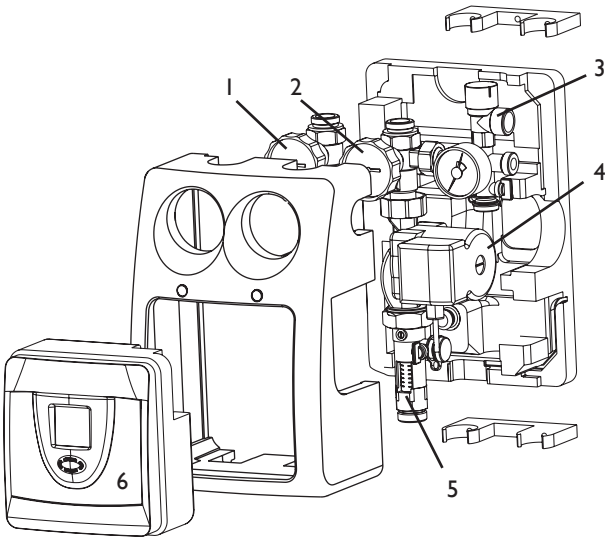

Fig. 10

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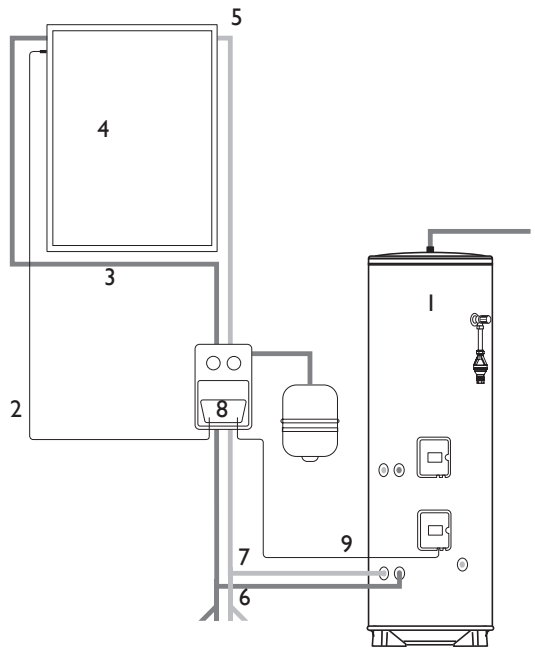
7.0 Installation of hydraulic station

Fig. 11



7.3

See Fig. 11

1 Solar cylinder
2 Collector temperature sensor lead
3 Solar primary flow (from collector)
4 Solar collectors
5 Solar primary return (to collector)
6 Solar primary flow (to cylinder)
7 Solar primary return (from cylinder)
8 Solar differential temperature controller
9 Cylinder temperature sensor lead

7.4 Pipework installation - general

1. In Solar Heating Systems, the collectors, the hydraulic station and solar cylinder (Fig. 11, Item 1) must be connected with brazed or silver soldered copper pipes, compression fittings or the multifit accessory flexible steel tube and insulation 5122238. **N.B.** Plastic pipes **MUST NOT** be used.

2. Connections supplied are suitable for pipe diameters of 22mm. However for short pipe runs (up to 10m flow and return) the use of 15mm diameter pipe is acceptable.

3. All connections and joints must be resistant to temperatures of up to 150°C and resistant to glycol.

4. The height difference between the highest point in the pipework (collector) and the hydraulic station may be a maximum of 15m (this is called the 'static height'). If the static height is greater than 15m a larger expansion vessel may be required.

5. If any pipe sealants are used these should be resistant to glycol and be able to withstand temperatures of up to 150°C.

6. Earthing pipework
All solar primary pipework between the solar collectors, hydraulic station and solar cylinder must be earth bonded to avoid electrical potential differences. This work must be carried out by a qualified electrician.

7. Fit earthing clamps to the solar primary flow and return pipes and connect the earth clamps to the earthing system of the property using an earth bonding cable in accordance with current IEE wiring regulations.;

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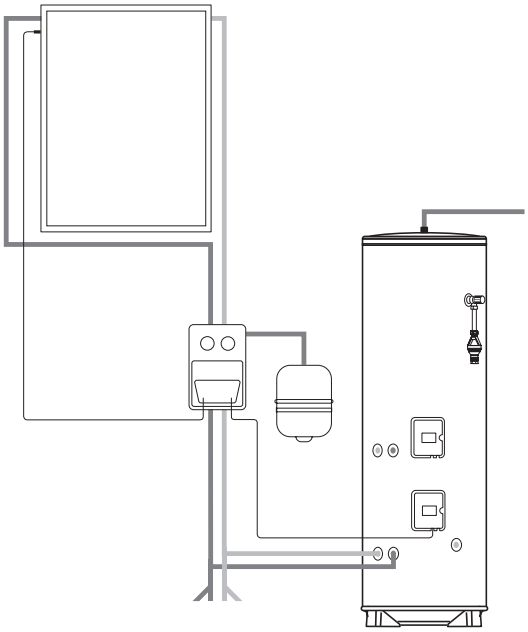
7.0 Installation of hydraulic station

Fig. 12



7.4 Pipework installation - general (cont)

8. Venting the pipework
The hydraulic station the component includes an air collector/separator and bleed point so an automatic air vent is not necessary. Any section of solar pipework that falls and rises again should be fitted with an additional air vent valve to relieve any trapped air which may cause air locking in the system. The automatic air vent and isolating valve used must be compatible with solar primary systems, i.e. be resistant to glycol and temperatures up to 180°C.

9. Insulating the pipework
External pipework should be insulated with high temperature resistant materials and be protected against UV degradation. The insulation must be peck-proof and rodent-proof. Internal pipework, especially through unheated spaces such as a loft space, should also be insulated with high temperature resistant materials. Mark the outside of any insulation to identify the flow and return pipes. The collectors are supplied with 2x2m pre insulated flexible stainless steel tubes. Additional lengths (30m) of stainless steel flexible tubes and high temperature insulation can be supplied.

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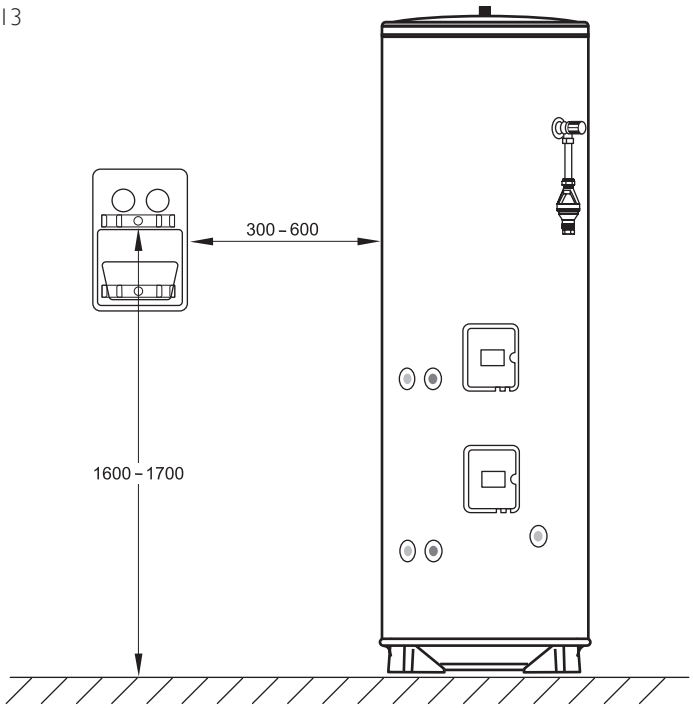
7.0 Installation of hydraulic station

Fig. 13



7.5 Installing the hydraulic station - positioning

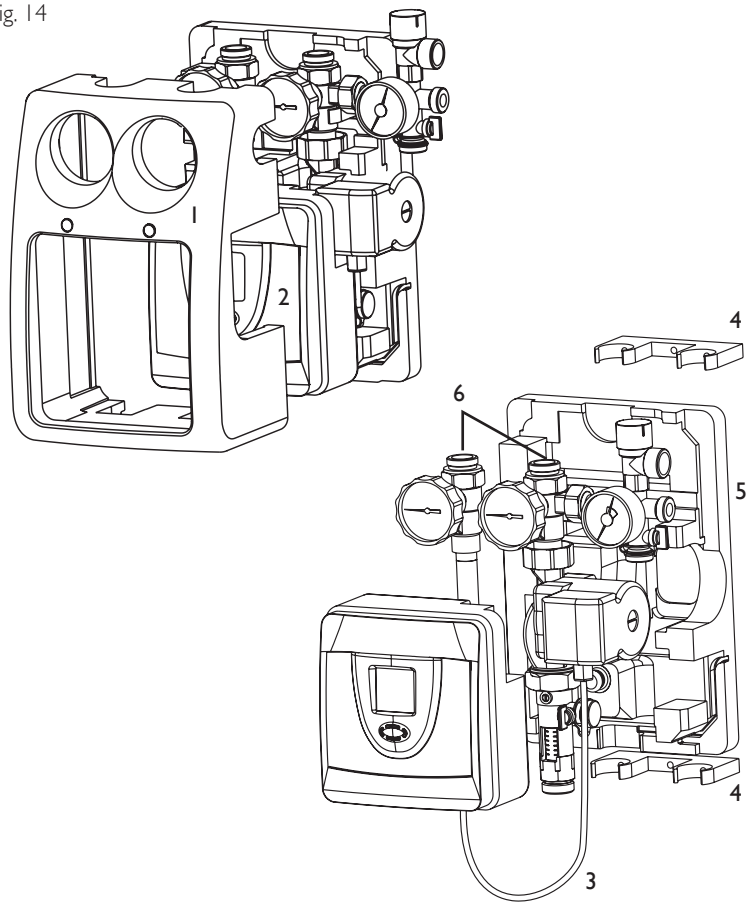
1. It is usual to install the hydraulic station and solar differential temperature controller near to the solar cylinder. However this does not have to be the case, the hydraulic station can be installed anywhere convenient on the solar primary pipework although adequate access will be necessary for commissioning and maintenance.

2. The solar differential controller should also be accessible for system operational monitoring. If not in close proximity to the solar cylinder it will be necessary to extend the solar cylinder temperature sensor cable, refer to section 9.6 for details of how to do this.

3.It is recommended that the upper mounting bracket of the hydraulic station is positioned approx. 1600 to 1700mm above the floor level for ease of access and operation of the controls, see Fig. 13.

4. When choosing the site for the hydraulic station provision of a discharge pipe from the safety group and the location of the solar expansion vessel must be considered.

Fig. 14



7.6 Installing the wall brackets and hydraulic station

1. Remove the front insulation moulding (Fig 14. Item 1) by pulling forward whilst holding the solar differential controller moulding (Fig 14. Item 2) in place, carefully remove the solar differential controller mounting by pulling forward and disconnect the pump cable connector (Fig 14. Item 3).

2. Place the hydraulic assembly on the wall at the desired location and mark the fixing positions through the holes in the mounting brackets.

3. Remove the hydraulic assembly from the mounting brackets (Fig 14. Item 4) and remove rear insulation moulding (Fig 14. Item 5).

4. Drill and plug the mounting positions and screw the mounting brackets into position.

5. Push the rear insulation moulding over the wall brackets and refit the hydraulic assembly (Fig 14. Item 6) to the mounting clips on the wall brackets.

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Fig. 15

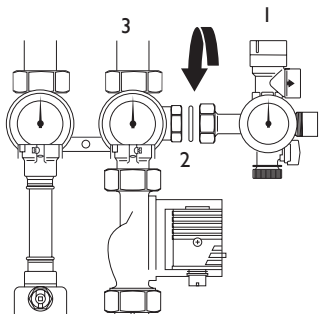


Fig. 16

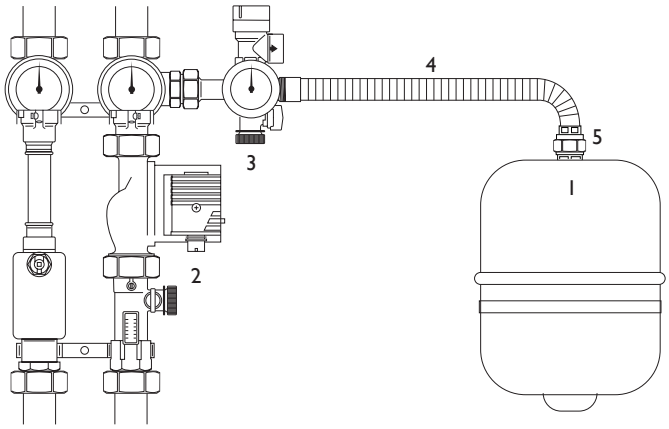


Fig. 17

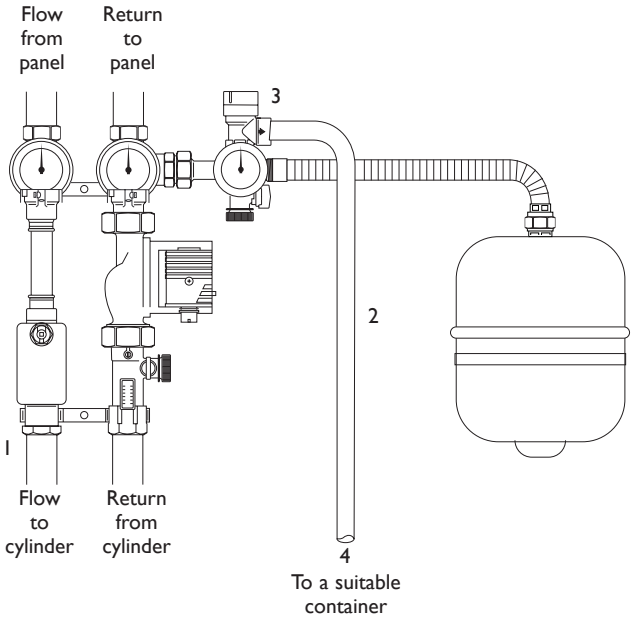
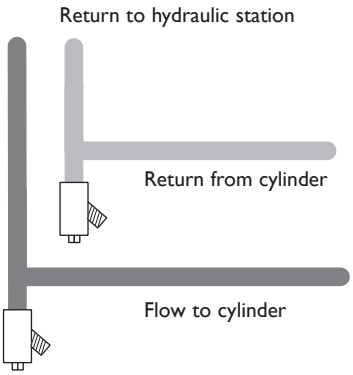


Fig. 18



7.0 Installation of hydraulic station

7.7 Installing the safety group

1. Connect the safety group (Fig 15 Item 1) to the connection on the hydraulic station return isolating valve assembly (Fig 15 Item 3). Ensure that the pre-fitted gasket is securely in place on the safety group prior to connection.

7.8 Connecting the solar expansion vessel

1. Mount the solar expansion vessel (Fig 16 Item 1) adjacent to the hydraulic station (Fig 16 Item 2) so that the vessel can be connected to the vessel connection of the safety group (Fig 16 Item 3) using the flexible pipe (Fig 16 Item 4) supplied. (**Note:** Solar expansion vessel, mounting bracket, self sealing connection and flexible pipe are supplied in the Ancillary Components kit).

2. The vessel must be mounted as shown (connection to top) and securely supported using the wall bracket supplied. The self sealing vessel connection should be screwed onto the vessel connection before connecting the flexible pipe (Fig. 16 Item 5).

3. **DO NOT** replace the solar expansion vessel with either a potable water expansion vessel or boiler sealed system vessel.

4. The charge pressure at the solar expansion vessel should be adjusted such that when not under load the charge pressure is 0.4 bar above the static system head (the height of the top of the collector panels above the hydraulic station). A one metre head represents 0.1 bar. However, the charge pressure should be at least 1.2 bar. The maximum static system head is 15m (1.5 bar).

7.9 Connecting pipework

1. Connect the flow and return pipes to the pump station via compression fittings (Fig 17 Item 1). Fittings are for 22mm o/dia pipe. Support the hydraulic assembly when tightening connections.

2. Installing a drain valve
It is recommended to install a device for draining the solar heating system (tee piece with drain valve, Fig. 18) into the flow and return at the lowest point in the solar heating system. The drain and its rubber seal must be suitable for solar applications.

3. Connecting the solar cylinder
For detailed installation instructions refer to the installation instructions supplied with the solar cylinder.

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Fig. 19

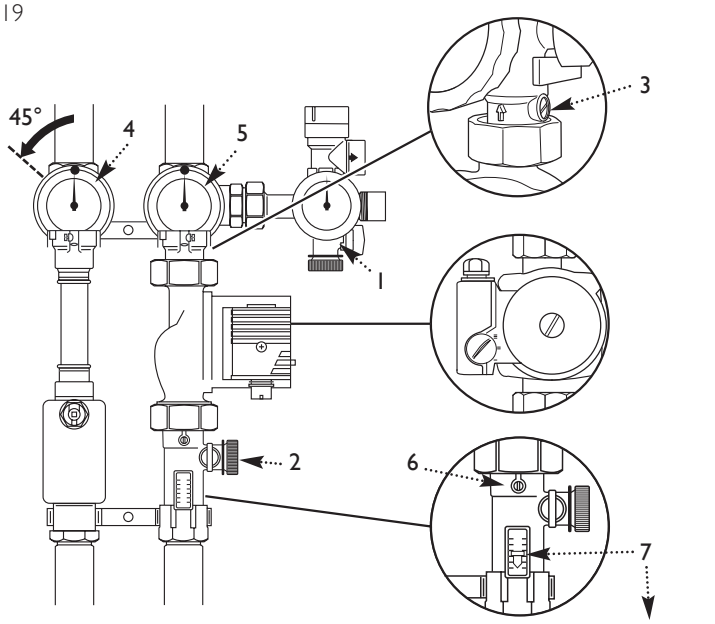


Fig. 20

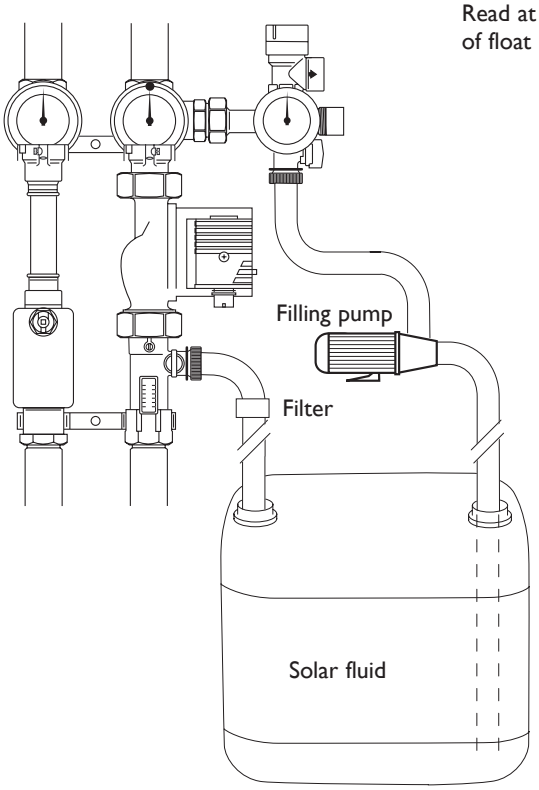
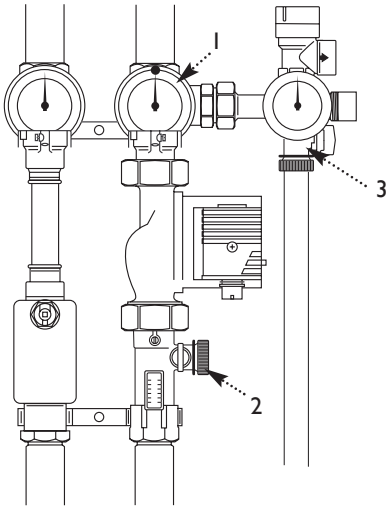


Fig. 21



8.0 Commissioning of system

8.1 Air Test

1. An air test may be used on the pipework to detect any gross leakage prior to flushing and filling with solar heat transfer fluid. Pressurise the system to a maximum of 1 bar to check for leaks.

2. Ensure that the solar expansion vessel pre-charge pressure has been set prior to flushing and filling.

8.2 Flushing and Filling the pipework

1. Before the system is commissioned the pipework must be flushed to remove any contaminants. **This must be done using the solar heat transfer fluid as it will be impossible to fully drain all parts of the system.**

2. Connect the flushing pipes to the fill & drain valve on the safety group (Fig. 19 Item 1) and to the fill & drain valve on the flow meter (Fig. 19 Item 2).

3. Open the fill & drain valves.

4. Turn the slot of the adjusting screw (Fig. 19 Item 3) in the return so the slot is vertical to open the non-return valve.

5. Turn the left hand isolating valve with integral thermometer in the flow (Fig. 19 Item 4) in the direction indicated by the arrow (to a 45° position) to open the non-return valve.

6. Ensure that the right hand isolating valve with integral thermometer in the return (Fig. 19 Item 5) is open indicated by the dot on the thermometer bezel being at the top.

7. Turn the slot of the flow meter adjusting screw (Fig. 19 Item 6) in the return vertically to open the flow limiter (Fig. 19 Item 7).

8. Flush the solar primary pump by pumping the fluid into the system via the fill and drain valve on the safety group (Fig. 19 Item 1).

9. Close right hand isolating valve (dot on thermometer bezel at 9 o'clock position). Flush solar primary pipework and collector via the fill and drain valve on the safety group. **If reusing flushed fluid ensure this is filtered before re-introducing into the system.** (see Fig. 20). Use a suitable container of a large enough volume to collect the fluid.

10. When satisfied that all pipework and component parts have been thoroughly flushed, the system can be filled.

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8.0 Commissioning of system

8.3 Flushing and Filling the pipework (cont)

11. Pour an amount of the solar heat transfer fluid into the filling pump.

12. Close the fill and drain valve - safety group (Fig. 19 Item 1) and the fill and drain valve - flow meter (Fig. 19 Item 2) and pressurise the pump slightly prior to filling the system. If an electric pump is being used follow the instructions with the pump.

13. Fully open the fill and drain valve on the safety group (Fig 19, item 1) and pump fluid into the system. Whilst pumping, open the flow meter drain valve (Fig 19, item 2) slightly to allow the air to vent out of the system.

14. When the pump is down to approximately 1 litre isolate the fill and drain valves. Vent the filling pump and refill with solar heat transfer fluid.

15. Re-pressurise the filling pump and repeat steps 3 and 4 above until fluid is seen discharging from the drain valve on the flow meter. (Fig 19, item 2). Close the drain valve.

16. Continue filling at the fill and drain valve on the safety group (Fig 19, item 1) until the system pressure reaches 2 bar.

17. At this point the circulation pump should be vented. If the system pressure drops, repressurise using the procedure above.

18. After venting the pump and checking that the system pressure is 2 bar, close the fill and drain valve on the safety group (Fig. 19 Item 1), and check the system for leaks.

19. Turn the left hand isolating valve (Fig 19, item 4) back 45° clockwise until the dot on the bezel is back at 12 o'clock.

20. Turn the right hand isolating valve (Fig. 19 Item 5) back 90° clockwise until the dot on the bezel is back at 12:00 O'clock.

21. Turn the slot of the adjusting screw (Fig. 19 Item 3) back to the horizontal position.

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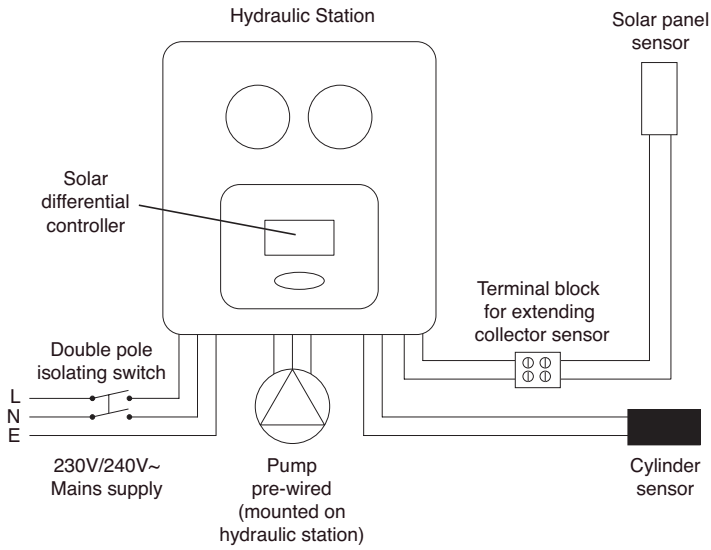
Fig. 22



9.0 Installation of solar controller

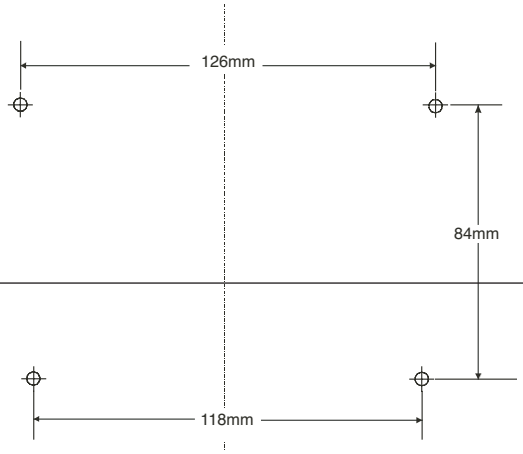
The collector panel temperature sensor should be installed in the sensor pocket at the collector array flow connector as part of the first fix process. Ensure that the cable from this sensor can be identified for connection to the pump station wiring centre. Use the 13m extension cable supplied if required.

9.1 Appliance installation

1. **Always disconnect from the mains before opening the controller cover.** The solar differential temperature controller is designed to be mounted on the front of the hydraulic station. Alternatively it can be removed from the insulation and be wall mounted (see panel below). In the case of wall mounting the pump cable may need to be lengthened.

Alternative mounting option

In the case of wall installation proceed in the following way:
Drill installation holes according to the dimensions shown below. Screw in two upper screws up to 6 mm distance. Open the appliance as described in section 10.2 and hang it onto two screws. Now two lower screws can be mounted. Tighten all screws. Do not overtighten to avoid damage to the controller backplate.



9.2 Opening the controller

1. Always disconnect from the mains before opening the controller cover.

2. No tools are required to open the controller. The front of the controller is secured by two latches which engage with the controller backplate.

3. It can be opened by gently pulling the lower side edges outwards and then hinging the front upwards.

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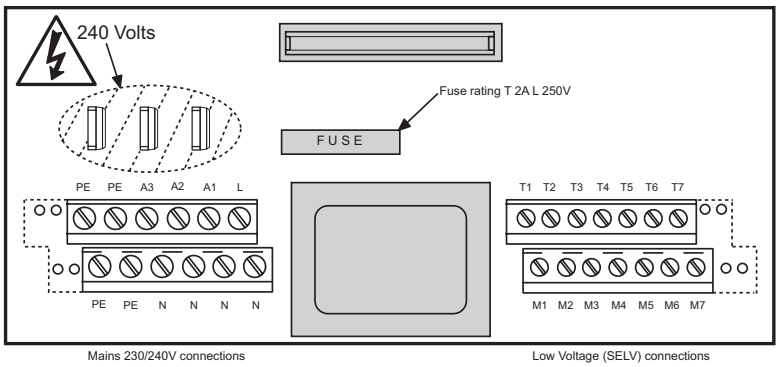
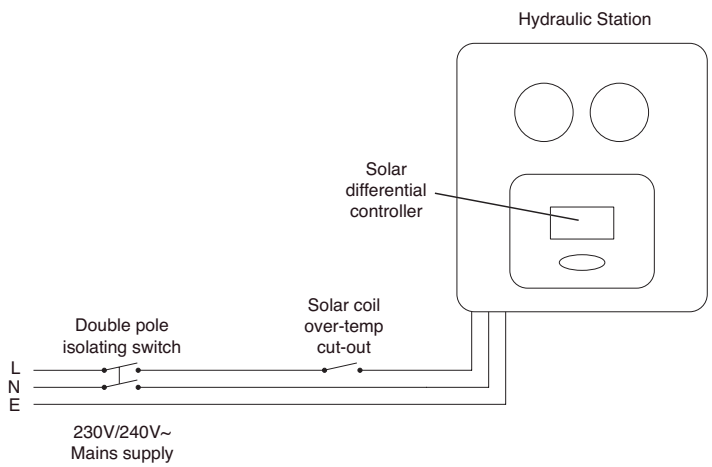
9.0 Installation of solar controller

Fig. 23


240 Volts
Fuse rating T 2A L 250V
FUSE
PE PE A3 A2 A1 L
PE PE N N N N
T1 T2 T3 T4 T5 T6 T7
M1 M2 M3 M4 M5 M6 M7
Mains 230/240V connections
Low Voltage (SELV) connections

Terminal Reference	Description
L	240V Supply Live
N	240V Supply Neutral
A1	Switched Output to Solar Pump
N	Solar Pump Neutral
A2	Switched Output - Live 2
N	Switched Output 2 Neutral
A3	Switched Output - Live 3
N	Switched Output 3 Neutral
PE	Earth Connection
T1 & M1	Temperature Sensor Collector 1
T2 & M2	Temperature Sensor Storage Tank 1
T3 & M3	Temperature Sensor Collector 2/Storage Tank 2
T4 & M4	Temperature Sensor Collector Return
T5 & M5	Temperature Sensor for 2nd temperature differential controller
T6 & M6	Frost Protection or 2nd temperature differential controller
T7 & M7	Flow Meter (Optional)

Fig. 24



9.3 Electrical connection overview

1. **Always disconnect from the mains before opening the controller cover.** The electrical installation must conform to all current Wiring Regulations and be carried out by a competent electrician.

2. The connection of all electrical cables is to the terminal block located on the backplate of the controller. The terminals on the right side of the terminal block are for extra low voltage connections (temperature sensors and flow transmitters). The terminals on the left side of the terminal block are for 230/240 V~ connections.

General connection guidelines.

3. In the case of all connecting wires the outer sheath should be stripped back to 80mm. The individual conductor sleeving should be stripped approx. 10mm.

4. Cables are inserted in the controller through knockouts provided in the controller backplate.

5. Flexible cables must be secured against straining by suitable strain relief bushes or devices.

6. The controller must be earthed.

9.4 230/240V~ connections

1. For 230V connections you must follow the following points:

2. The mains supply to the controller should be via a suitable double pole isolating switch with a contact separation of at least 3mm in both poles. Additionally for unvented solar cylinders the controller should be wired via the solar coil over temperature cutout such that power is interrupted to the controller and hydraulic station in the event of the unvented cylinder overheating (see Fig. 24).

3. Controllers are intended for the operation in 230/240V~ /50Hz mains. Any motorised valves connected must be suitable for this voltage.

4. All earth wires must be connected to terminals marked with PE. Any bare wire earth conductors must be sleeved with green/yellow sleeving.

5. The neutral terminals (N) are electrically connected and are not switched.

6. All switch outputs (A1, A2 and A3) are 230/240V~ closers. If potential-free contacts are needed, appropriate accessories are required.

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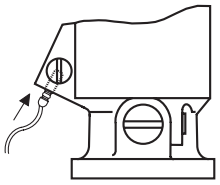
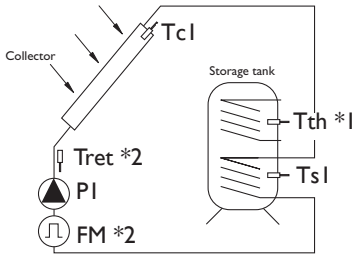
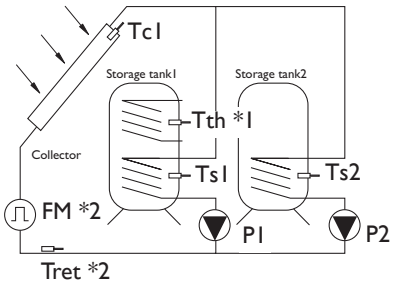
Fig. 25

Type 0:
1 collector, 1 storage tank

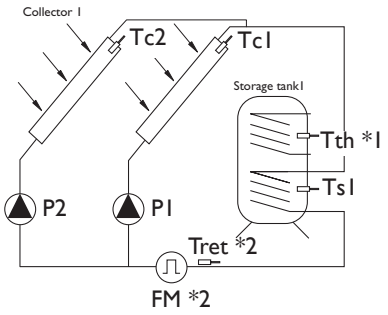




Type 2:
1 collector, 2 storage tanks
with 2 pumps



Type 4:
2 collectors, 1 storage tank
with 2 pumps



*1 Accessory 84515063
*2 Accessory 84515064 (kit)

9.0 Installation of solar controller

9.5 Solar Gain measurement (Accessories required)

The controller is capable of measuring solar gain if accessories are fitted to the system, see Fig. 25.

1. For solar gain (energy productivity) measurement it is necessary to fit the collector return sensor as shown in the diagram in Fig. 25. and input the correct flow value.

2. The collector return sensor must be fitted to the pocket in the pump station return line (for system type 0) or securely attached to a common return pipe with cable ties and fully insulated (for systems type 2 and type 4).

3. The solar gain of the system is calculated on the basis of the temperature difference between the collector flow and return and the solar primary circulation flow rate.

4. If the accessories are fitted, the function must be switched "on" when commissioning the Solar Differential Temperature Controller.

5. For System Types 2 and 4 the additional pump (P2) can be ordered as an accessory, Part No. 720294302 together with additional sensors TS2/TC2 as required.

Key	Description
Tc1	Temperature Sensor - Collector 1
Tc2	Temperature Sensor - Collector 2
Tth	Temperature Sensor - Thermostat
Ts1	Temperature Sensor - Storage 1
Ts2	Temperature Sensor - Storage 2
Tret	Temperature Sensor - Collector Return
P1	Circulation Pump 1
P2	Circulation Pump 2
FM	Flow Meter
Tfr *	Temperature Sensor - Frost Protection

* not shown

System type		Output terminal designation (see Fig. 23)		
Type	**Description**	**A1**	**A2**	**A3**
0	1 collector array, 1 storage cylinder	P1	-	Cooling or thermostat or diff. controller
2	1 collector array, 2 storage cylinder (pump-pump)	P1	P2	Cooling or thermostat or diff. controller
4	2 collector array, 1 storage cylinder (pump-pump)	P1	P2	Cooling or thermostat or diff. controller

System Type	System Description	T1	T2	T3	T4	T5	T6	T7
0	1 collector array, 1 storage cylinder	Tc1	Ts1	-	Tret	Tth	Tfr	FM
2	1 collector array, 2 storage cylinders	Tc1	Ts1	Ts2	Tret	Tth	Tfr	FM
4	2 collector arrays, 1 storage cylinder	Tc1	Ts1	Tc2	Tret	Tth	Tfr	FM

NOTE: The solar gain flowmeter must be connected to sensor terminals marked T7 (see Fig. 23) (Where fitted).

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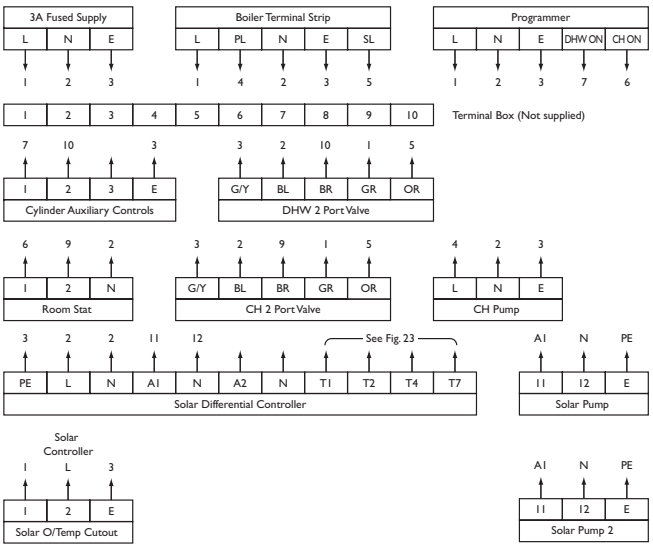
Fig. 26

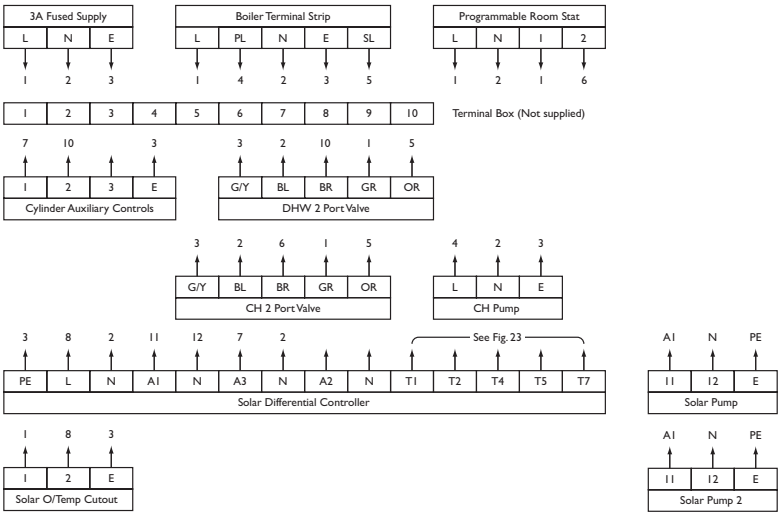
Block Wiring Schemes

A. In conjunction with auxiliary heating by boiler - no reheat control by solar controller.

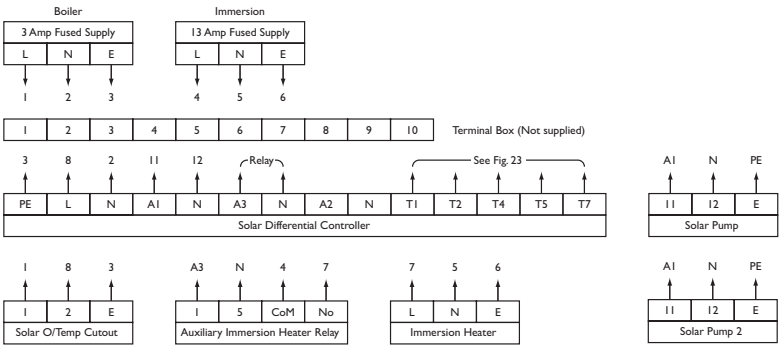


Note: For Boilers without Pump over run CH Pump Live Supply to 5

B. In conjunction with auxiliary heating by boiler - reheat control via solar controller.



C. Solar Cylinder with auxiliary heating by immersion heater.



9.0 Installation of solar controller

9.6 Connection of temperature sensors

1. The controller uses precise platinum temperature sensors type PT1000. The controller is supplied with a cylinder sensor ready wired. **The sensor with black silicone sheathing** (supplied with the first fix kit) **must be used for the solar panel sensor**.

2. **Installation / cabling of temperature sensors:**
a) Mount the sensors in the pockets provided in the collector and storage tank. When installing into the collector panel sensor pocket the sensor should be secured and sealed with High Temperature UV resistant silcone sealant.

b) The wires of the temperature sensors can be lengthened. Up to 15m long you need a 2 x 0,5mm^2 cross-section, up to 50m 2 x 0,75mm^2. In the case of long connections (collector) shielded extension lead must be used. **DO NOT** run sensor leads adjacent to mains carrying voltage conductors (at least 50mm separation is recommended).

c)Temperature sensor is supplied connected to the appropriate terminals, refer to Fig 26. The sensors are polarity free.

d) Sensors **MUST NOT** be connected to the 230/240V~ terminals.

9.7 Control of Auxiliary heat input

1. When using the reheat function the operation of the auxiliary heat input device can be controlled via output A3 from the controller (Accessory required).

2. The reheat sensor cable is connected to terminals T5 and M5 of the solar controller and the sensor element be inserted into the controls pocket at the auxiliary heater level (Accessory).

3. **N.B.** The maximum switching current of the controller is 2A so if switching an electrical immersion heater this MUST be done via a relay (see Fig. 26 Block Wiring Scheme C) order accessory code No. 5122765.

4. If using a boiler for auxiliary input, the output from the reheat function should be integrated into the boiler control circuit.

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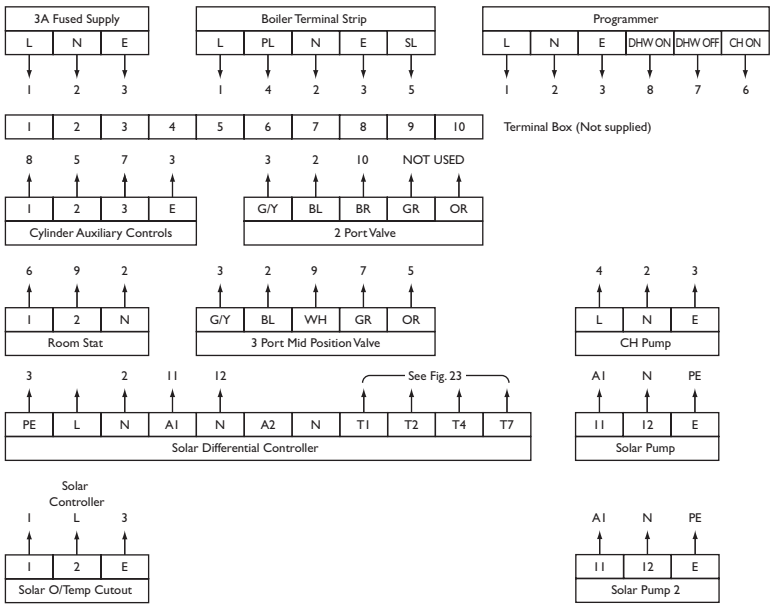
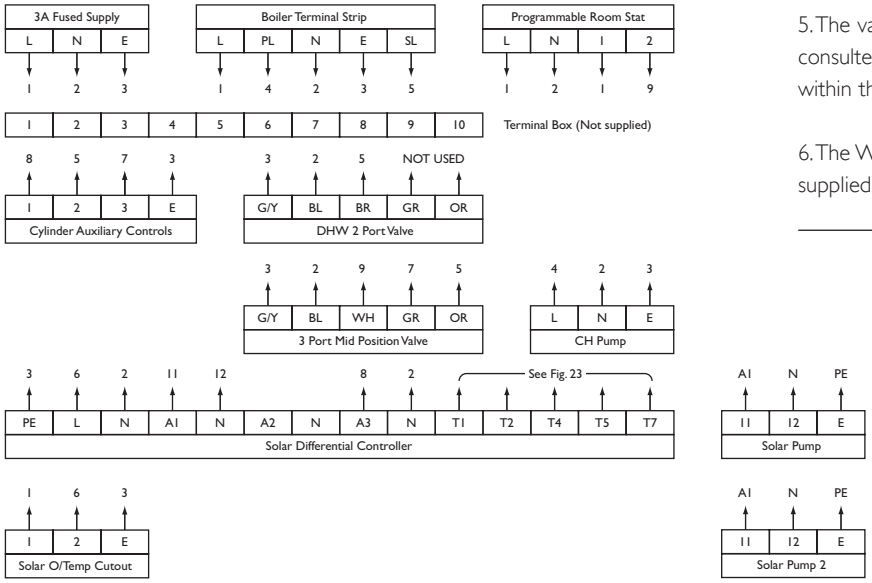
Fig. 26

D. Auxiliary heating by boiler with 3 port mid position valve system - no reheat control by solar controller.



E. Auxiliary heating by boiler with 3 port mid position valve system - reheat control by solar controller.


3A Fused Supply
L N E
1 2 3
Boiler Terminal Strip
L PL N E SL
1 4 2 3 5
Programmable Room Stat
L N 1 2
1 2 1 9
1 2 3 4 5 6 7 8 9 10
Terminal Box (Not supplied)
8 5 7 3
1 2 3 E
Cylinder Auxiliary Controls
3 2 5 NOT USED
G/Y BL BR GR OR
DHW 2 Port Valve
3 2 9 7 5
G/Y BL WH GR OR
3 Port Mid Position Valve
4 2 3
L N E
CH Pump
3 6 2 11 12 8 2
See Fig. 23
PE L N A1 N A2 N A3 N T1 T2 T4 T5 T7
Solar Differential Controller
A1 N PE
11 12 E
Solar Pump
1 6 3
1 2 E
Solar O/Temp Cutout
A1 N PE
11 12 E
Solar Pump 2

9.0 Installation of solar controller

9.8

1. Key to abbreviations:

L	-	Live
N	-	Neutral
E	-	Earth
PL	-	Pump Live
SL	-	Switched Live
G/Y	-	Green and Yellow
BL	-	Blue
BR	-	Brown
GR	-	Grey
OR	-	Orange
WH	-	White

2. The wiring schemes assume the use of an unvented Solar DHW cylinders.

3. These diagrams are presented for guidance only, terminal numbers may differ between different manufacturers equipment.

4. Main accept no liability for any loss or damage arising from any errors or omissions that may be inadvertently contained within these diagrams.

5. The various ancillary equipment manufacturers should be consulted to confirm the correct operation of their products within the system.

6. The Warranty only applies to equipment and controls supplied with the system.

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10.0 Commissioning of hydraulic station

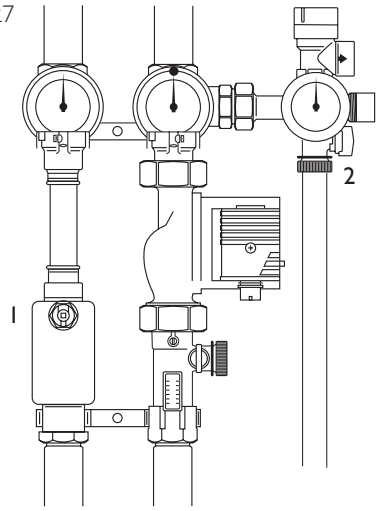
10.1 Ensure the solar primary system is free from air

1. Switch on the power supply to the solar differential temperature controller.

2. Manually switch the circulation pump ON and OFF via the solar differential temperature controller (see section 11.5) to pump fluid around the solar primary system.

3. Turn the pump off and open the airbleed screw on the air separator (Fig. 27 Item 1). Bleed any air from the air separator. If the system pressure drops top up by opening the fill and drain valve (Fig. 27 Item 2) on the safety group and pumping in more solar fluid to restore the pressure. This must be repeated until the pressure remains stable.

Fig. 27



10.2 Setting the system pressure

1. During commissioning, the system pressure should be 0.7 bar above the static pressure (1 metre height differential equals 0.1 bar). However, it must be at least 1.5 bar and no higher than 2.2 bar.

2. Determine the system pressure when the system is cold (20°C). This should be recorded on the Commissioning Record Sheet.

3. If the pressure is too low you should pump additional heat transfer fluid into the system; the fill & drain valve on the safety group (Fig. 27 Item 2) needs to be opened for this purpose. When system pressure is correctly set, ensure the fill and drain valve is closed and remove filling hose from safety group.

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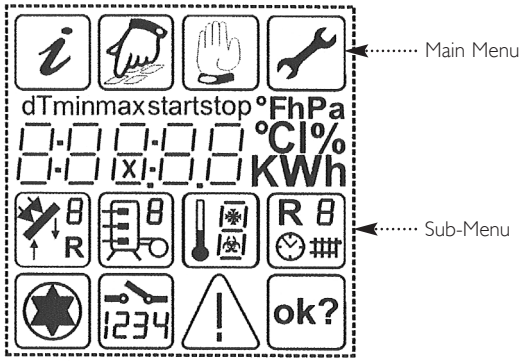
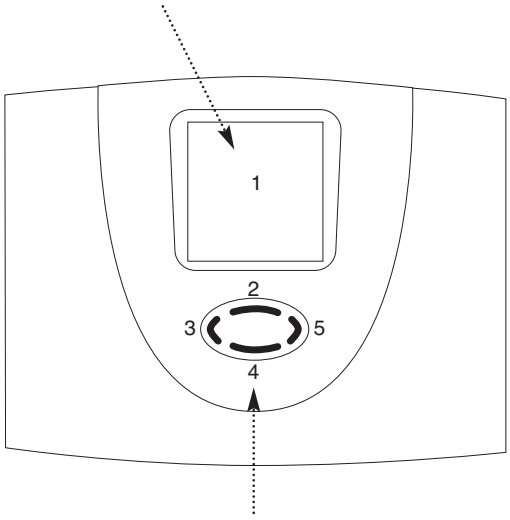
Fig. 28
Diagram of all possible symbols



1

Display Screen



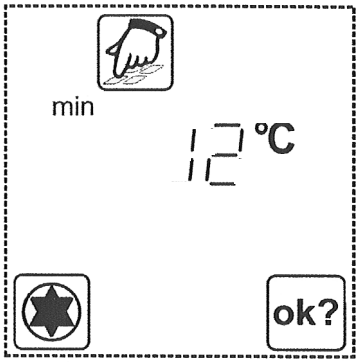
2 Scroll upwards

4 Scroll downwards or select required main menu

3 Scroll left or exit to main menu

5 Scroll right or select to edit function

Example Screen - Programming Menu



11.0 Commissioning of solar controller

On completion of commissioning the Solar Controller, note all the required information in the Solar Commissioning Record Sheet at the end of Section 12.

11.1 Main Menu

To make the operation of the controller clear, operating and display functions are divided into 4 main menus.

Info	Indication of current measured values. Indication of system condition. Indication of error messages. Indication of operating hours and energy productivity (if installed).
Programming	Changes to programmable values (parameters).
Manual operation	Switching on and off connected pumps and auxiliary devices.

WARNING - During manual operation there is no automatic regulation of the system. Temperature control is isolated. System temperature could be extremely high.

Basic adjustment	**Information about basic adjustment for system function. To carry out any changes to this menu it must be selected within the first minute after switching the appliance on. IMPORTANT: Adjustment and changes in this menu must only be carried out by a competent installer or service engineer.**

Each active menu is shown in the upper line of the display by its corresponding icon.

11.2 Control Button

When in the Main Menu the control button functions are as follows:

Item 2 - Scroll upwards - no function in this menu
Item 3 - Scroll left - moves left through the main menu options
Item 4 - Scroll down - selects the menu option currently flashing and gives access to the sub-menu
Item 5 - Scroll right - moves right through the main menu options

Once the sub-menu has been accessed, the flashing symbol becomes static and the button functions are then as follows:

Item 2 - Scroll upwards - moves up through the available functions of the sub-menu
Item 3 - Scroll left - return to main menu
Item 4 - Scroll down - moves down through the available functions of the sub-menu
Item 5 - Scroll right - select to edit the function displayed. The selected function will flash if it is available for editing. Use 2 to increase the required value and 4 to reduce it. Use 5 to OK.

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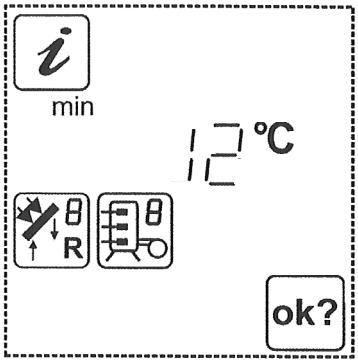
Fig. 29



Press or to scroll up or down to the required sub function. The icon will flash, press to select the function. Reset by pressing or for increase/decrease values. Press and ok? appears, press to confirm and ok? disappears.

11.0 Commissioning of solar controller

11.3 Menu "Info"

In this menu mode all measured values and operating states are shown.

If the values are marked as "reset possible", they may be reset in the following way:

Choose the value with buttons and

Reset value by means of the button

Message "OK?" confirm with = no or = yes

Indication e.g.		Meaning	Reset possible?
75 °C		Indication of current collector(s) temperature.	No
min 12°C		Indication of minimum collector(s) temperature. Resettable to current temperature.	Yes
max 105°C		Indication of maximum collector(s) temperature. Resettable to current temperature.	Yes
52 °C		Indication of current temperature storage tank(s).	No
min 40°C		Indication of minimum temperature storage tank(s). Resettable to current temperature.	Yes
max 65°C		Indication of maximum temperature storage tank(s). Resettable to current temperature.	Yes
60°C		Displays current return temperature (only if Return sensor fitted)	No
60°C		Heating, Cooling, Temperature difference controller T1…T6 * Only displayed when activated	No
35°C		Temperature difference controller for additional store. * Only displayed if temperature sensor fitted (not supplied as standard).	No
25 °C		Antifreeze sensor Indication of universal temperature measuring points (T6). * Only displayed if temperature sensor fitted (not supplied as standard).	No
1234 h		Operating hours for charging storage tank(s). Resettable to 0 h.	Yes
927 kWh		Energy productivity for storage tank(s). Resettable to 0 kWh (only if accessories fitted).	Yes

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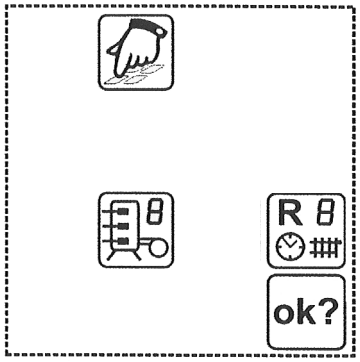
Fig. 30



Press or to scroll up or down to the required sub function. The icon will flash, press to select the function. Reset by pressing or for increase/decrease values. Press and ok? appears, press to confirm and ok? disappears.

11.0 Commissioning of solar controller

11.4 Menu "Programming"

1.All adjustable parameters can be checked in this menu and, if necessary, changed. The default factory setting will usually give efficient and problem free operation.

2. For more information or guidance please contact the Technical Enquiries.

Indication		Meaning	Value range	Typical adjustment
max 65 °C		Storage tank 1 or 2: Maximum permissible temperature	**15 - 65°C (15 - 95°C Tank 2)**	**65°C**
dT max 7 K		Storage tank 1 or 2: switch-on differential (dTon)	**3 - 40K**	**7K**
dT min 3 K		Storage tank 1 or 2: switch-off differential (dToff)	**2 - 35K**	**3K**
Min 100	1 2	Minimum pump speed allowed. 100% = rotational speed regulation set to 'off'	**30% - 100%**	**100%**
40 °C		Switch-on temperature of thermostat function (Only available with Reheat Sensor accessory fitted)	**20 - 90°C**	**40°C**
dT 10 K		Hysteresis of thermostat function (Only available with Reheat Sensor accessory fitted)	**1 - 30K**	**10K**
max 65 °C	R 2	2nd temperature difference controller: maximum temperature of additional store Tmax (Accessory sensor required)	**15 - 95°C**	**65°C**
dT max 7 K	R 2	2nd temperature difference controller: Hysteresis dTmax (Accessory sensor required)	**3 - 40K**	**7K**

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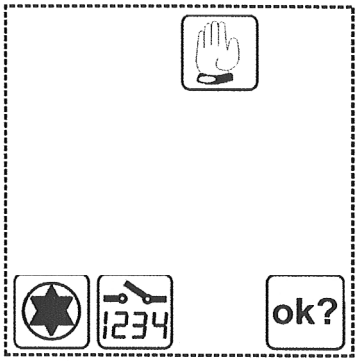
Fig. 31



Press or to scroll up or down to the required sub function. The icon will flash, press to select the function. Reset by pressing or for increase/decrease values. Press and ok? appears, press to confirm and ok? disappears.

11.0 Commissioning of solar controller

11.5 Menu "Manual operation"

1. For commissioning, service and test purposes the solar primary system can be manually operated. For this purpose the switch outputs may be disconnected or connected.

WARNING - During manual operation there is no automatic regulation of the system. Temperature control is isolated. System temperature could be extremely high. During manual operation there is no automatic regulation of the system.

2. To avoid inadmissible operating states this mode of operation changes into "Indication" after approximately 8 hours and the automatic regulation is activated again.

Indication	Meaning	Value range
1	Switching on/off switch output A1 (solar circulation pump) by hand.	**0 = off 1 = on**
2	Switching on/off switch output A2 (pump2/valve1) by hand.	**0 = off 1 = on**
3	Switching on/off switch output A3 (cooling, thermostat or 2nd temperature difference controller function) by hand. (only if Parameter 11 is not set to 0)	**0 = off 1 = on**

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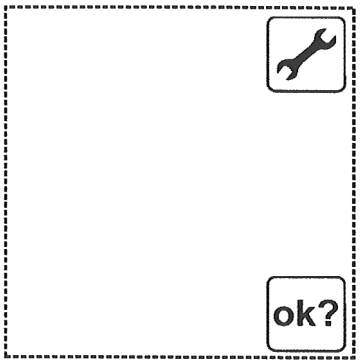
Fig. 32



Press (-) or (+) to scroll up or down to the required sub function. The icon will flash, press ( ) to select the function. Reset by pressing (-) or (+) for increase/decrease values. Press ( ) and ok? appears, press ( ) to confirm and ok? disappears.

11.0 Commissioning of solar controller

11.6 Menu "Basic adjustment"

1. Adjustment and changes in this menu must be carried out only by a competent installer or service engineer. **Incorrect adjustments may adversely affect the function of controller and solar primary system.**

2. To avoid accidental changes in menu "Basic adjustment", it is not editable in normal functioning but has only a display function. To be able to carry out any changes, this menu must be chosen within the first minute after switching on the appliance. **The basic adjustment menu is 'blocked' automatically one minute after switching on if the menu is not accessed.**

Indication / Line / value	Description	Value range	Factory set-up
0 -- 0	Switching on or off collector protection function	0 = off 1 = on	0
1 -- 120 °C	Temperature at which the collector protection function is active	110..150°C	120°C
2 -- 0	Switching on or off function recooling (only when the collector protection is on)	0 = off 1 = on	0
3 -- 40 °C	Temperature to which the storage tank is recooled after active collector protection function	30..90°C	40°C
4 -- 0	Special function for time-controlled circulation in operation with tube collectors	0 = off 1 = on	0
5 -- 0 Note: A Flow Meter is available for this product as an accessory if required - Code no. 84515064.	Energy yield measurement 'Off'	0	0
	Energy yield measurement with flow meter	1	
6 -- 11	Choosing used glycol types	0...11	11
7 -- 100	Mixture percentage of coolant	0 ... 100% 5% - steps	100
8 -- --	No value shown, when item 5 is set to 0	-----	---
L/Impulse	Adjustment value when item 5 is set to 1 Set value to '1' if used with 84515064	0.5 – 25 Litres per impulse	
9 -- 0	Switching antifreeze function on or off. (Accessory sensor required(T6))	0 = off 1 = on	0
10 -- 3 °C	Temperature at which antifreeze function is active	-20 °C ... +7 °C	3
11 -- 0	Alternative choice of cooling function, thermostat function or the 2nd temperature differential controller (Accessory sensor required (T5))	0 = off 1 = cooling 2 = thermostat	0
12 -- 0	Hydraulic system layout	0...4	0

0	Anro	6	Tyfocor L5.5 - supplied
1	Ilexan E, Glythermin	7	Dowcal 10
2	Antifrogen L	8	Dowcal 20
3	Antifrogen N	9	Dowcal N
4	Ilexan E	10	Tyfocor LS
5	Ilexan P	11	Fernox S1

For correct operation of the system, Main recommend the factory settings shown above.

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Fig. 33

Graphic symbol	Description	Indication in operation
Measuring points assignment		
	Temperature measuring point collector array 1	
	Temperature measuring point collector array 2	
	Temperature measuring point storage tank 1 solar (storage tank 1 charging)	
	Temperature measuring point storage tank solar (storage tank 2 charging)	
	Temperature measuring point collector - return	
	Temperature measuring point storage tank (auxiliary heating)	
	Antifreezing sensor or universal temperatures measuring point (T6) (no sensor monitoring)	
	Auxiliary heating temperature	
	Operating hours, energy productivity measurement	

Status indication		
	Solar circulation pump	Symbol revolves when solar circulation pump is on
	Switch output 1 is active	Appears when switch output 1 is active (on)
	Switch output 2 is active	Appears when switch output 2 is active (on)
	Switch output 3 is active	Appears when switch output 3 is active (on)
	Reference to system fault	Display flashes when a fault occurs in the system
	Safety query for value changes which are to be stored	Input value can be either rejected or accepted

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11.8 Overview of display and operating elements (cont)

Fig. 34

Graphic symbol	Description	Indication in operation
	Indicator values	
dT	Temperature difference	
min	Min value	Appears when minimum values are indicated
max	Max value	Appears when maximum values are indicated
88.8.8	5 x 7 segment display. Presentation of figures 00000 to 99999	Display of all values, display flashes when a value is changed
°C	Temperature in Celsius	
K	Temperature difference in Kelvin	
h	Operating hours	
kWh	Productivity indication in kWh	

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11.0 Commissioning of solar controller

11.9 Controller functions

1. The differential temperature controller contains many functions to regulate and monitor the solar primary system. Including
- controller functions for heating the solar cylinder
- functions for system protection and system monitoring
- additional functions (other accessories may be required to achieve these functions).

11.10 General controller functions

1. The controller collects the temperatures from various measuring points and determines the right time to charge the storage tank on account of programmed (additional) functions and controller parameters.

11.11 Cylinder heating by solar primary system

1. Switching action can be adjusted through dTmax (dTon) and dTmin (dToff). The solar cylinder is heated by operating the solar pump on output A1 up to the set maximum storage temperature (65°C). Pump operation starts when the Collector temperature exceeds the cylinder temperature by more than dTon and continues while the collector temperature is above cylinder temperature + dToff, as set in the programming menu. dTon cannot be set lower than dToff + 1K.

Corresponding values in menu
"Programming"
Maximum temperature
dT max (dT on) Switch-on temperature difference
dT min (dT off) Switch-off temperature difference

11.12 Systems with two storage cylinders

For systems with more than one storage cylinder (system type 2), the cylinder with sensor Ts1 will always take priority. Usually the cylinder with lower priority will have a lower temperature than that with the higher priority. Once the higher priority cylinder is satisfied the system will redirect the energy to the lower priority cylinder. Normally, this will reduce the temperature in the collector array.

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11.13 Rotational speed regulation

1. The solar circulation pump on 230V-outputs A1 and A2 can be operated either in switch-mode (two-point controller) or in a rotational speed regulated way. If the rotational speed regulation is activated the pump power is adjusted by a controller so that switch-on temperature difference "Storage tank dTmax" is kept constant as much as possible. At lower deviation of "Storage tank dTmax" the pump is operated with the lowest power till the switch-off wave is reached.

Corresponding values in menu	
"Basic adjustment"	**"Programming"**
---	Rotational speed min <100%

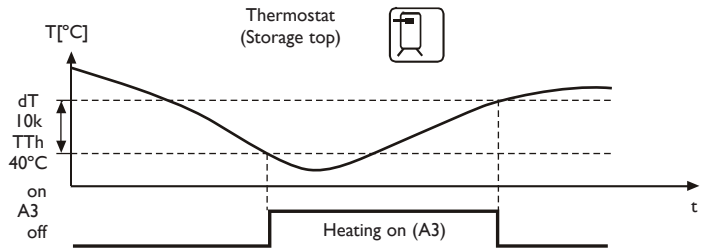

Fig. 35

11.14 Thermostat (heating)

(Accessory required 84515063)
1. The thermostat is an independent control circuit from the storage loading. Thus, auxiliary heating of the top area of the storage cylinder is made possible.
The output A3 will be:
- Switched on, when the temperature falls below the adjusted start level.
- Switched off, when the temperature reaches the adjusted start level + hysteresis.

Corresponding values in menu	
"Basic adjustment"	**"Programming"**
11 -- 2	Start temperature max °C
11 -- 2	Hysteresis dT in K

11.15 Thermostat (cooling)

1. In order to optimise the energy yield, it could be useful to "redirect" the solar energy, or to take it away from the storage when the storage temperature reaches a pre-set level.
When the sensor reaches the start temperature, output A3 will be switched on. When the temperature level falls below the start temperature hysteresis, the output A3 will be switched off.

Corresponding values in menu	
"Basic adjustment"	**"Programming"**
11 -- 1	Start temperature max °C
11 -- 1	Hysteresis dT in K

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11.0 Commissioning of solar controller

11.16 Tube collector

1. The function "tube collector" can be switched off/on in the "Basic setting" menu – point 4. When activated, the solar pump will be switched on every 30 minutes for a period of 30 seconds to check for any heat gain in the collector.

11.17 Sensor monitoring

1. The sensors and their connecting cables are constantly monitored for any break or short circuit. If a faulty sensor is detected by the controller, the symbol ⚠ is shown. By scrolling up and down you can detect the source of the error.

⚠ The use of the wrong type of temperature sensors can also give rise to an error message

Indication	Meaning
	Short circuit on temperature sensor of the current measuring point
	Break on temperature sensor of the current measuring point, circulation error at activated energy productivity measurement/Sensor missing

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11.0 Commissioning of solar controller

11.18 Flow monitoring

1. If during normal operation the flow temperature rises above 90°C, a warning indication will be shown.

2. If the energy productivity measurement option is deactivated, the temperature difference between collector and storage tank is checked. If the temperature differential exceeds 60K + dTmax this error message will occur, as under normal system operation where the pump is running, large temperature differences would not normally be seen.

3. If the energy productivity measurement option (accessory required) is activated, the flow rate is checked, if no flow is detected for 15 minutes this error message will be seen.

Indication	Meaning
	Fluid flow is above 90°C (indication) / Missing circulation in solar circuit (if accessory flow meter fitted)

11.19 System protection function

1. The system protection function switches the system off if the "maximum collector temperature" is exceeded by 10K. As soon as the temperature drops below the "maximum collector temperature", the system restarts. This function has priority and is always active, regardless of whether the collector protection is on or off.

11.20 Frost protection

1. This function can be switched on or off by using item 9 in the "Basic adjustments" menu. The start temperature can be adjusted with item 10. Furthermore, a frost protection sensor must be fitted to T6 (accessory required).

2. If the measured value is lower than the start temperature, the solar pump is activated until the adjusted frost protection start temperature +5K is reached. The minimum runtime of the pump is 5 minutes.

3. For safety reasons the function is deactivated if the temperature of the priority storage falls below 5°C.

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11.0 Commissioning of solar controller

11.21 Energy productivity measurement

1. For the purposes of energy productivity measurement (solar gain), a sensor on the collector return line and an optional flow meter are required Accessory kit No. 84515064. The yield value is calculated from the values of the temperature difference between the collector and collector return line and the value measured by the flow meter. This function is switched on and off in the "Basic settings" menu.

Corresponding values in menu		
"Basic Setting"	**"Programming"**	**"info"**
5 -- 1	---	XXXX kWh

11.22 Operating hours meter

1. When the storage tank is being charged by a pump, the operating hours meter records for each separate pump. The number of operating hours can be read in the "info" menu. This may be reset to '0'.

Corresponding values in menu	
"Programming"	**"info"**
---	XXXX h

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12.0 Setting the system flow rate

12.1 Checking and adjusting the flow rate

Fig. 36

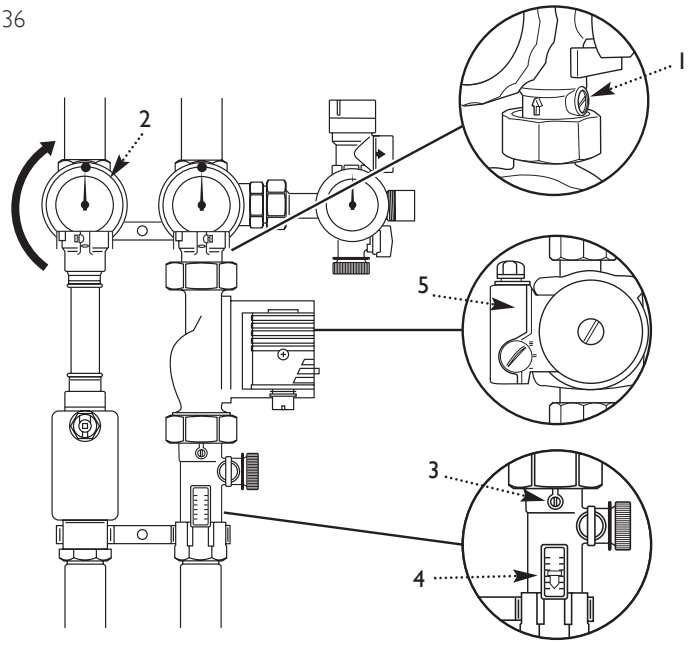


Table 1

Flow rate (when system is cold)	
Area	l/min
2m²	2 - 4
3m²	3 - 6
4m²	4 - 8
5m²	5 - 10
6m²	6 - 12

1. Adjust the flow rate when the system is cold (approx 20°C) (see Fig. 36).

2. The flow rate should be adjusted to give the optimum flow rate depending on the number and type of collector(s) connected.

3. Manually operate the solar pump (See Section 11.5).

4. Set the solar pump speed selector (Fig. 36 Item 5) so that the required flow rate is achieved or exceeded with the lowest possible setting. The flow limiter adjusting screw (Fig. 36 Item 3) can be used to fine-tune the flow rate.

5. Depending on the number and type of collectors installed, set the required flow rate from table (See Table 1).

6. The float in the flow meter will indicate the circulation flow rate through the flow meter sight glass (Fig. 36 Item 4).

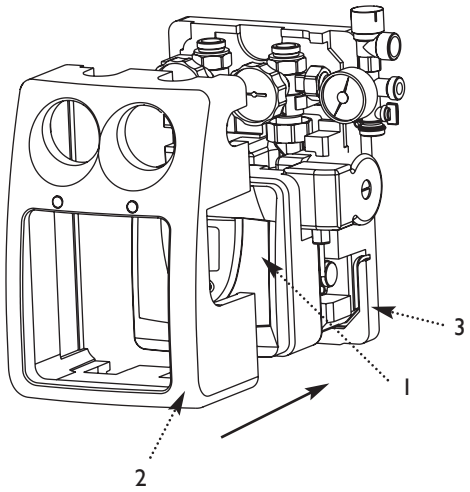
7. Adjust screw of the flow limiter (Fig. 36 Item 3) with a screwdriver, until the upper edge of the float in the sight glass indicates the required flow rate (Fig. 36 Item 4). Turn the screw anticlockwise to increase the flow.

8. Ensure that the float is stable when the pump is running.

9. Set manual pump operation to off (See Section 11.5).

12.2 Installation of the thermal insulation

Fig. 37



1. Refit the controller mounting moulding (Fig. 37 Item 1) onto the rear moulding.

2. Push the front thermal insulation (Fig. 37 Item 2) against the rear thermal insulation section (Fig. 37 Item 3) until it clips into place.

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Commissioning record

The following chart should be completed during Commissioning of the system.

Installer: _____ BPEC No.: _____

Contact details: _____ Serial Nos. Cylinder _____

Original commissioning date: _____ Collector _____

Pump Station Serial Number: _____

General Commissioning	
All pipework correctly installed, identified and earth bonded	❑
Solar expansion vessel charge pressure checked and set before filling the system	❑ bar
Solar primary system filled with heat transfer fluid supplied	❑
System pressure test carried out	❑
Air vented from system	❑
Exposed pipework insulated using high-temp and weather resistant insulation (bird/rodent-proof)	❑
collector installation weatherproof	❑
Collector fixings checked and secure	❑
Hydraulic Station	
System pressure when cold	bar
Solar primary flow when cold	l/min
Isolating/non-return valves (flow and return) in operating position	❑
Solar Collectors	
Collector visually inspected for defects	❑
Collector temperature sensors correctly installed and secured	❑
Pipe entry points to building weatherproof	❑
Solar Differential Temperature Controller	
Record all operational parameters set (see separate table)	❑
Pump operation tested in automatic and manual modes	❑
All cables correctly installed and secured	❑
Suitably fused isolating device installed	❑
Controller earthed	❑
Solar Cylinder	
Cylinder installed and commissioned in accordance with cylinder installation instructions	❑

Solar differential temperature controller - operational parameters

If any factory values are changed please enter the new values in the table below.

Adjustable in menu "Programming"	Typical adjustment	Current adjustment
Storage tank1: Maximum storage temperature	65°C	*
Storage tank1: switch-on difference (dTon)	7 K	
Storage tank1: switch-off difference (dToff)	3 K	
Storage tank2: Storage temperature	65°C	*
Storage tank2: switch-on difference (dTon)	7 K	
Storage tank2: switch-off difference (dToff)	3 K	
Minimum pump power on rotational speed regulation	100%	
Switch-on temperature of thermostat function	40°C	
Hysteresis of thermostat function	10 K	
2nd temperature differential controller maximum temperature Tmax	65°C	
2nd temperature differential controller hysteresis dTmax	7 K	

Adjustable in menu "Basic adjustments"	Typical adjustment	Current adjustment
Switching on or off the function collector protection	0 = off	*
Temperature at which the collector protection function is active	120°C	*
Switching on or off the function recooling (only when the collector protection is on)	0 = off	*
Temperature to which the storage tank is recooled when collector protection function is on	40°C	*
Function for time-controlled circulation in operation with tube collectors	0 = off	
Switching on or off the function energy productivity measurement	0 = off	
Choice of glycol types used	0 = Anro	
Mixture ratio of coolants	50%	
Litres per impulse of the flowmeter	1.0 L/l	
Switching on or off the function antifreezing	0 = off	
Temperature at which the antifreezing is active	-1°C	
Alternative choice of the cooling, thermostat function or the 2nd temperature differential controller	0 = none	
System type	type 0	

* Main recommends these settings are left at the default value.

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Servicing and maintenance record

Please complete the following record after any Servicing or Maintenance of the system. Refer to the Commissioning Record charts for details of the original system for reference. Refer to Maintenance section for recommended Maintenance periods

	Date / /	**Date** / /	**Date** / /	**Date** / /	**Date** / /	**Date** / /	**Date** / /	**Date** / /	**Date** / /	**Date** / /	**Date** / /	**Date** / /	**Date** / /
Check condition of all pipework + insulation	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Check condition of mountings	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Check frost protection of solar fluid (every 2 years) Concentration Check pH (7.0 - 9.5) Protection to °C Next check date	 ____ ____ ____ ____	 ____ ____ ____ ____	 ____ ____ ____ ____	 ____ ____ ____ ____	 ____ ____ ____ ____	 ____ ____ ____ ____	 ____ ____ ____ ____	 ____ ____ ____ ____	 ____ ____ ____ ____	 ____ ____ ____ ____	 ____ ____ ____ ____	 ____ ____ ____ ____	 ____ ____ ____ ____
Check solar expansion vessel charge pressure	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar
Check solar primary system pressure (cold)	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar
Check solar primary system flow rate	l/min	l/min	l/min	l/min	l/min	l/min	l/min	l/min	l/min	l/min	l/min	l/min	l/min
Check operation of PRV	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Check discharge vessel fluid level	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Check sensor operation (use resistance/temperature table. See page 43)	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Check solar cylinder in accordance with manufacturer's instructions	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Ensure system is free of air	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Visually check condition of solar collector mountings	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
KWh recorded (if applicable)	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Visually check condition of any waterproofing (around pipe entries to roof and roof fixings)	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Engineer's initials	____	____	____	____	____	____	____	____	____	____	____	____	____

BPEC Number

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	Date / /	Date / /	Date / /	Date / /	Date / /	Date / /	Date / /	Date / /	Date / /	Date / /	Date / /	Date / /	Date / /
Check condition of all pipework + insulation	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Check condition of mountings	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Check frost protection of solar fluid (every 2 years) Concentration Check pH (7.0 - 9.5) Protection to °C Next check date	 ____ ____ ____ ____	 ____ ____ ____ ____	 ____ ____ ____ ____	 ____ ____ ____ ____	 ____ ____ ____ ____	 ____ ____ ____ ____	 ____ ____ ____ ____	 ____ ____ ____ ____	 ____ ____ ____ ____	 ____ ____ ____ ____	 ____ ____ ____ ____	 ____ ____ ____ ____	 ____ ____ ____ ____
Check solar expansion vessel charge pressure	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar
Check solar primary system pressure (cold)	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar	bar
Check solar primary system flow rate	l/min	l/min	l/min	l/min	l/min	l/min	l/min	l/min	l/min	l/min	l/min	l/min	l/min
Check operation of PRV	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Check discharge vessel fluid level	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Check sensor operation (use resistance/temperature table. See page 43)	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Check solar cylinder in accordance with manufacturer's instructions	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Ensure system is free of air	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Visually check condition of solar collector mountings	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
KWh recorded (if applicable)	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Visually check condition of any waterproofing around pipe entries to roof and roof fixings	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Engineer's initials	____	____	____	____	____	____	____	____	____	____	____	____	____

13.0 Maintenance

13.1 Check heat transfer fluid

1. The heat transfer fluid must be checked every year with regard to its antifreeze and pH value. (7.0 - 9.5)

- Check antifreeze using antifreeze tester. Target value is approximately -21 deg C (40% concentration). Replace fluid if necessary.

13.2 Maintenance of the collector

1. The collector or the collector array must be checked/serviced annually to check for any damage, leaks or contamination.

2. In areas where there may be a build up of dirt on the collector, only non-abrasive cleaning materials and methods should be used to clean the collectors and mounting system components.

13.3 Cylinder

1. Refer to manufacturer's documentation.

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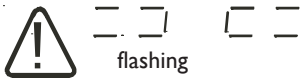
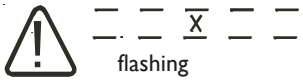
14.0 Fault finding

14.1 Failures with error message

1. Some system failure modes can be recognised by the solar differential temperature controller and will be indicated by an error message on the controller display. Refer to the table below for details of possible errors and suggested measures to rectify.

Error representation on display	Possible reasons	Measures
 flashing	• Sensor wire broken	• Check wire
	• Sensor defect	• Check sensor resistance, if necessary exchange sensor
	• Sensor missing	• Check parameter settings and sensor installation requirements
 flashing	• Short circuit in sensor wire • Sensor defect	• Check wire • Check sensor resistance, if necessary exchange sensor
Circulation error: no flow flashing Additionally at energy productivity measurement:	• Error in pump connection	• Check cabling
	• Pump defect	• Exchange pump
	• Air in the system	• Check the float of the flow meter moves when the system runs (if visible)
	• Connection with flow meter defect	• Check wire
	• Sensor wire broken	• Check wire
	• Sensor defect	• Check sensor resistance, if necessary exchange sensor
	• Sensor missing	• Check parameter settings and sensor installation requirements

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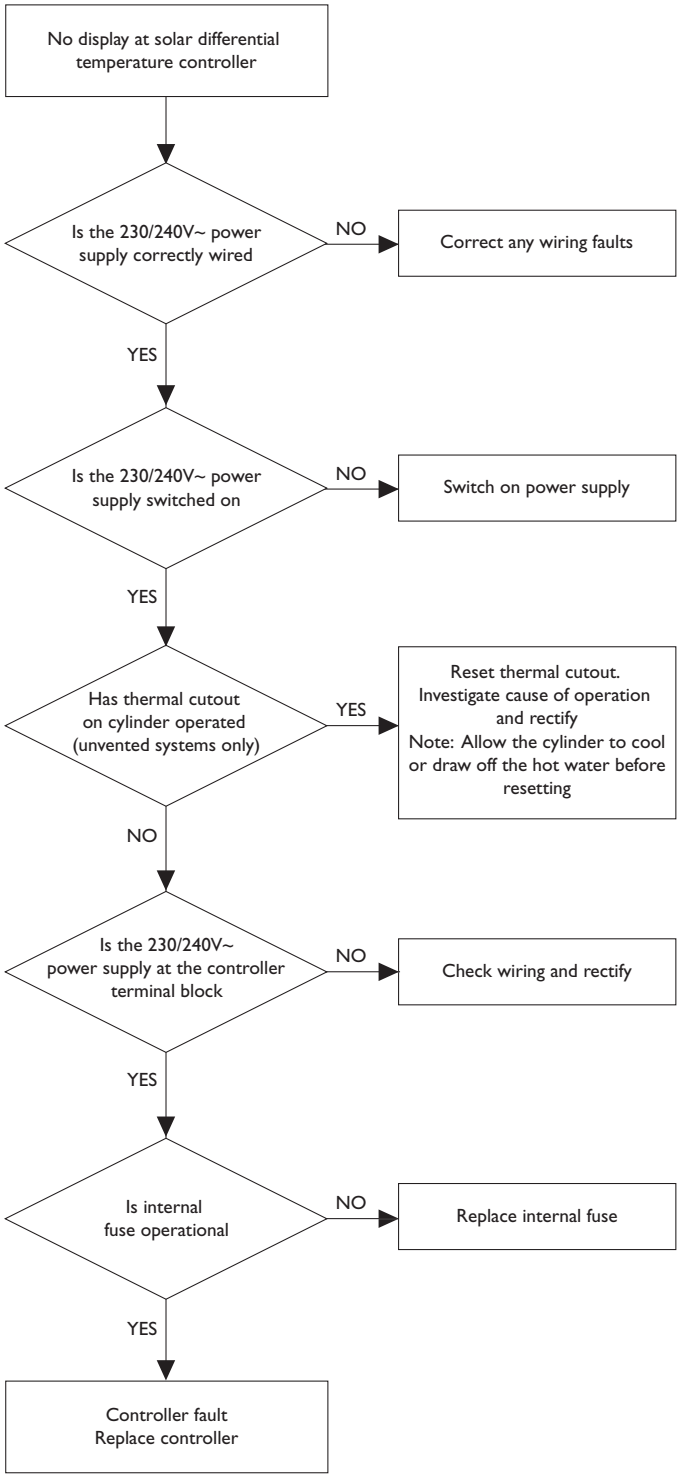
No display at solar differential temperature controller
Is the 230/240V~ power supply correctly wired
NO
Correct any wiring faults
YES
Is the 230/240V~ power supply switched on
NO
Switch on power supply
YES
Has thermal cutout on cylinder operated (unvented systems only)
YES
Reset thermal cutout. Investigate cause of operation and rectify
Note: Allow the cylinder to cool or draw off the hot water before resetting
NO
Is the 230/240V~ power supply at the controller terminal block
NO
Check wiring and rectify
YES
Is internal fuse operational
NO
Replace internal fuse
YES
Controller fault
Replace controller

14.0 Fault finding

Resistance table PT1000.
The correct function of temperature sensors can be checked on the basis of the following temperature resistance table with a resistance measuring instrument:

Temperature in °C	Resistance in Ohm
-30	882
-20	921
-10	960
0	1000
10	1039
20	1077
30	1116
40	1155
50	1194
60	1232
70	1271
80	1309
90	1347
100	1385
120	1461
140	1535
200	1758

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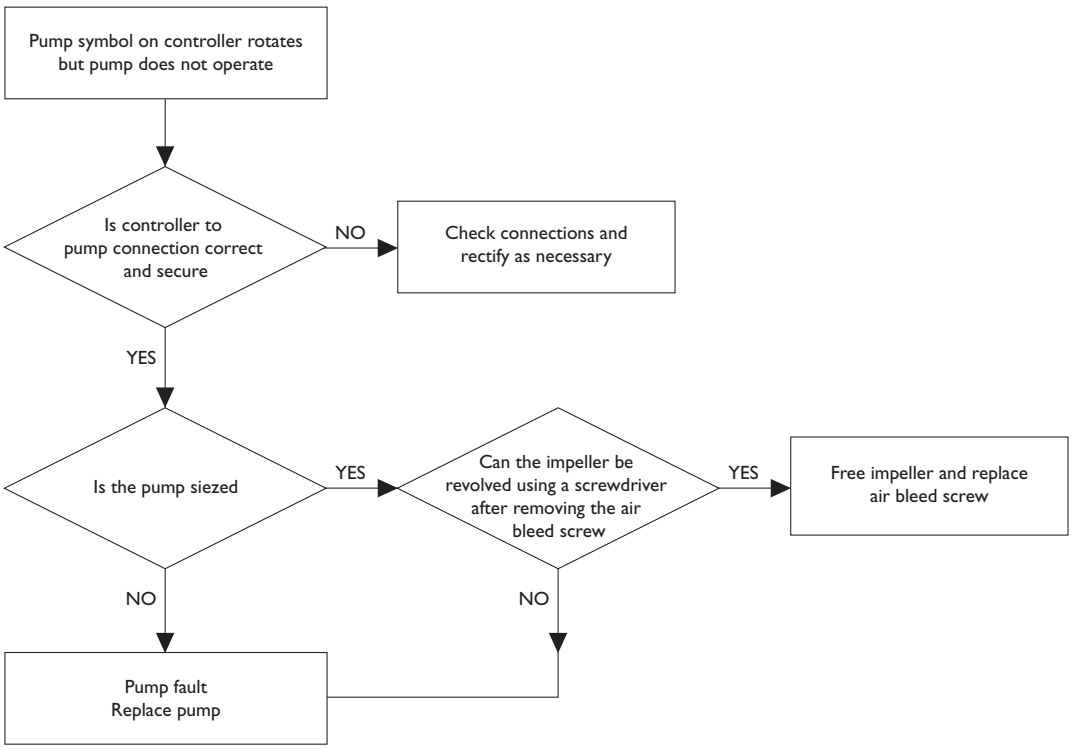
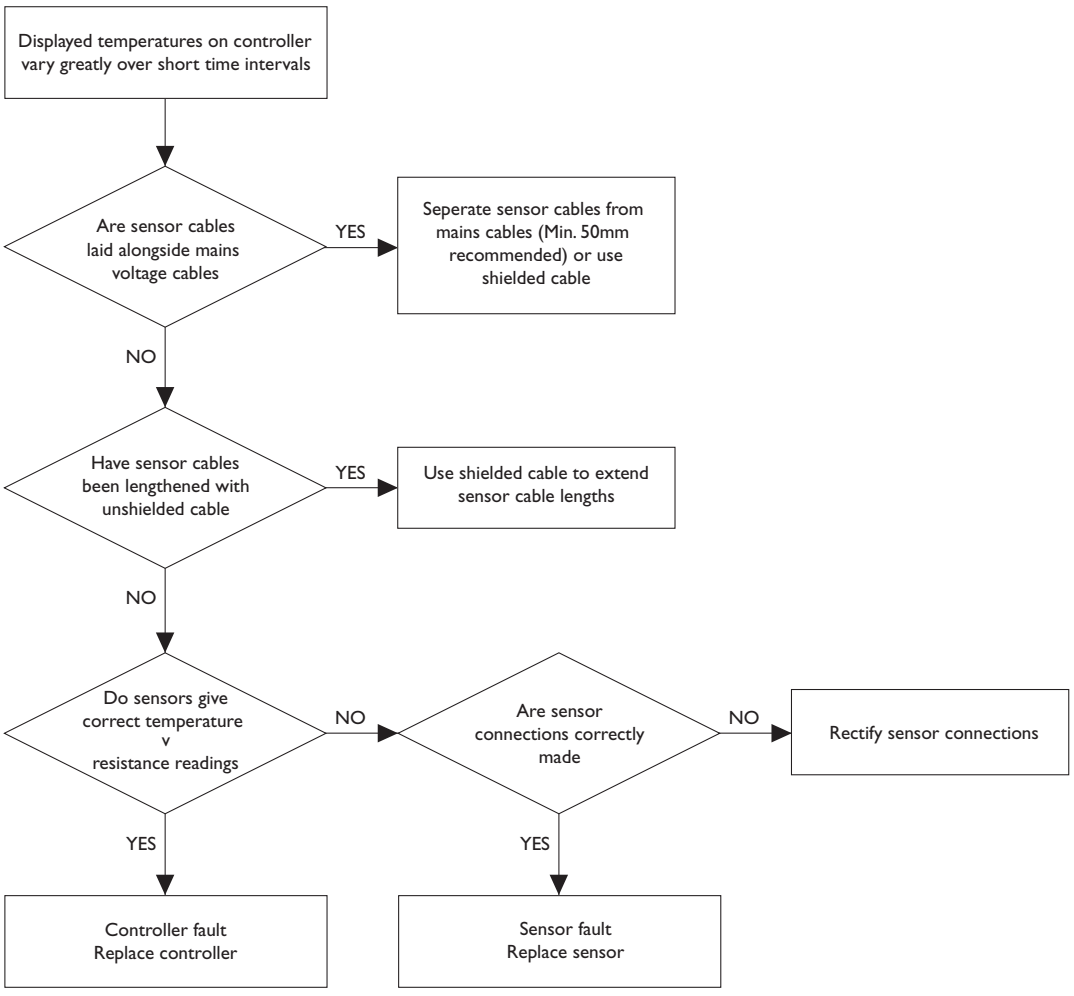

Pump symbol on controller rotates but pump does not operate
Is controller to pump connection correct and secure
NO
Check connections and rectify as necessary
YES
Is the pump siezed
YES
Can the impeller be revolved using a screwdriver after removing the air bleed screw
YES
Free impeller and replace air bleed screw
NO
NO
Pump fault
Replace pump


Displayed temperatures on controller vary greatly over short time intervals
Are sensor cables laid alongside mains voltage cables
YES
Seperate sensor cables from mains cables (Min. 50mm recommended) or use shielded cable
NO
Have sensor cables been lengthened with unshielded cable
YES
Use shielded cable to extend sensor cable lengths
NO
Do sensors give correct temperature v resistance readings
NO
Are sensor connections correctly made
NO
Rectify sensor connections
YES
YES
Controller fault
Replace controller
Sensor fault
Replace sensor

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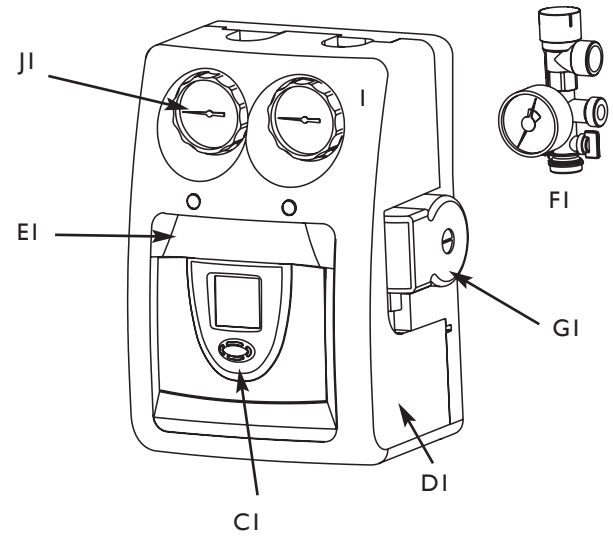

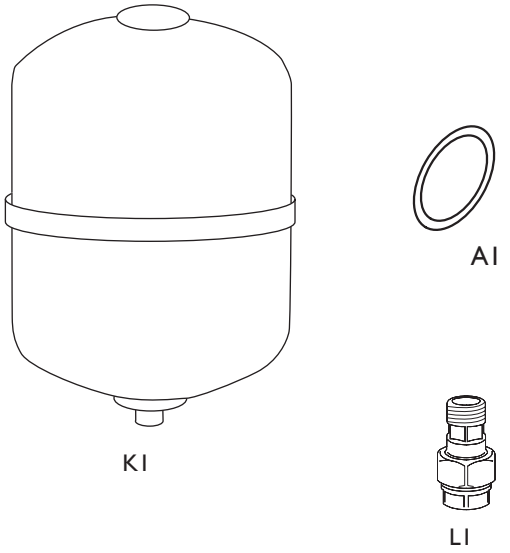

15.0 Spares

15.1 Spare parts and Accessories

1. A number of Spare Parts are available should any part of the system require replacement. Use only genuine parts obtained from Main, use of other non Main parts may cause system malfunctions and will invalidate the warranty. Fitting of any spare parts must be carried out by a competent installer or authorised service engineer or agent.

Short Parts List

Key No.	Description	Manufacturer's Part No.
A1	Connection Washer	5119535
B1	Temperature Sensor	720224801
C1	Solar Differential Temperature Controller	720709401
D1	Insulation	720689701
E1	Insulation Insert	720689901
F1	Safety Group	720690901
G1	Solar Primary Circulating Pump	720688101
J1	Temperature Gauge	720689101
K1	Solar Expansion Vessel 24Litres	5119548
L1	Expansion Vessel Self-sealing Connection	5119779

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16.0 Warranty

16.1 Standard Warranty Terms & Conditions

Solar Collectors 10 Years
Solar Control Station 1 Years

To receive your free warranty please complete the form supplied with the system within 30 days of installation, or simply call heateam, the service division of Main Heating UK Limited on 0844 871 1568

Our promise to you
If you experience a fault with your new system, we aim to provide a safe and high quality repair service supported by our dedicated national network of highly skilled engineers. If your installer can't resolve the problem for you, we will do everything we can to get an engineer out to you as quickly as possible. Nothing in this warranty will affect your statutory consumer rights.

What you need to do if you experience a problem with your system.
You should always contact your installer first because the fault may not be related to the system. If your installer confirms that the fault is within the system itself and he/she decides they cannot repair it our friendly customer service team is on hand to help. Simply call our service division heateam on 0844 871 1568 to book an engineer visit or for any general advice that you may need. Our contact centre is open Monday to Friday 8am - 6pm, weekends and Bank Holidays 8.30am - 2pm, excluding Christmas Day and New Years Day.

When calling heateam you must have the following information to hand: -
– System serial number
– System model number
– Your installer name, address details and contact details
– Proof of purchase (if you do not have the serial number)

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16.0 Warranty

16.1 Standard Warranty Terms & Conditions (cont)

What this warranty covers

– Free of charge repair or replacement of components found to be faulty from manufacture.
– Free of charge replacement of the complete assemblies provided always that the failure is related to a manufacturing fault that cannot be repaired or is beyond repair.

The warranty runs from the date your product is installed.

What this warranty does not cover

– Collectors that are installed damaged or damaged during installation. If a collector is found to be damaged on delivery then it must not be installed, simply return it to your supplier for replacement under warranty.
– The warranty will become invalid if the failure is due to frost, transient voltages, lightning strikes or any act of vandalism or mis use.
– This guarantee does not cover the effects of scale.
– Tampering or modification will invalidate this warranty.
– The installation must be in an appropriate location and its use is restricted to potable water.
– Due to the varied locations collector/s can be installed Main Heating UK Ltd will only carry out warranty repair/replacement to collector which have safe access provided that meets current Health & Safety working at heights requirements. Heateam will cover the cost of any safety equipment required to meet this standard after the first 30 days of installation up to 1 years and will appoint a contractor to carry this work out. Prior to this contact your installer. Heateam accept no liability for any third party damage.
– Repairs to system which haven't been installed and commissioned properly, as set out in the installation and commissioning instructions.
– Any other defects or failures, either in the connected system or outside of the system itself.
– Installations within commercial settings for which this system was not designed.
– Reimbursement of any third party repair or replacement costs that we haven't been told about and agreed with you in advance.
– Compensation for consequential losses (e.g. loss of earnings, business losses, stress and inconvenience) arising from a product breakdown, including repair delays caused by factors outside our reasonable control.

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All descriptions and illustrations provided in this leaflet have been carefully prepared but we reserve the right to make changes and improvements in our products which may affect the accuracy of the information contained in this leaflet. All goods are sold subject to our standard Conditions of Sale which are available on request.

MAIN

Brooks House, Coventry Road, Warwick. CV34 4LL
Technical Enquiries 0844 8711568
Our contact centre is open Monday to Friday 8am to 6pm,
Weekends and Bank Holidays 8.30am to 2pm.
We are closed Christmas Day and New Years Day.
Website www.mainheating.co.uk

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